*** CONFIDENTIAL ***

Input Federal 1995
Distribution Report

January 3, 1996

Code	Company	MMAR -EO
RGA04-20	AT&T GLOBAL INFORMATION, Sharp, John	2
RGB02-12	BOOZ-ALLEN & HAMILTON, Pelehach, Dennis	2
RGB03-16	BOEING INFORMATION SERVICES, Needham, Be	2
RGB29-15	BELL ATLANTIC FEDERAL SYSTEMS, Hecht-Kis	1
RGB29-45	BELL ATLANTIC, Callahan, Dennis	1
RGC38-2	COMPREHENSIVE TECHNOLOGIES INT, Hall, Ja	1
RGC38-5	COMPREHENSIVE TECHNOLOGY, Brittingham, M	1
RGC40-34	CACI, INC., Gostel, Mary	1
RGC40-42	CACI, INC., Parker, Bill	1
RGD01-21	DIGITAL EQUIPMENT CORPORATION, Spitbrook	1
RGD01-23	DIGITAL EQUIPMENT CORPORATION, Koscielni	1
RGD01-44	DIGITAL EQUIPMENT CORPORATION, Breeding,	1
RGD01-58	DIGITAL EQUIPMENT CORPORATION, Dyson, Tr	2
RGD27-44	DELL COMPUTER CORPORATION, Funk, George	2
RGE38-1	E-SYSTEMS, INC.(GARLAND DIV.), Reinkemey	1
RGF99-1	FORTRAN CORPORATION, Meador, Linda	1
RGG02-6	GTE GOVERNMENT SYSTEMS, Slepian, Carina	1
RGG04-1	GOVERNMENT TECHNOLOGY SVC/GTSI, Pesheck,	2
RGG05-10	NORTHROP-GRUMMAN, Calavas, Steve	1
RGH04-40	HEWLETT-PACKARD, Creighton, Pat	1
RGI01-36A	IBM FEDERAL SYSTEMS, Marquardt, Neil	2
RGL14-14	LOCKHEED MARTIN ENG. & SCIENCE, Saltsman	1
RGM01-1	LOCKHEED MARTIN INFO. SYSTEMS, Burgess,	1
RGM01-18	LOCKHEED MARTIN INFO. SYSTEMS, Sihler, B	1
RGM29-2	MITRE CORPORATION, THE, Kersch, Beth	1
RGM29-3	MITRE CORPORATION, THE, Roth, Beth	1
RGN04-44	NORTEL, Jones, Larry	1
RGN105-1	N.E.T. FEDERAL, Clarkson, Thomas	2
RGN93-2	NETWORK GENERAL CORPORATION, Knapp, Rick	1
RGS49-1	BAY NETWORKS, Rogers, Jennifer	1
RGS56-1	SKYTEL CORPORATION, Spohn, George	1
RGT07-4	TEXAS INSTRUMENTS, Orginz, Harold	1
RGT21-1	TASC, Himmelberger, Peter	1
RGU11-14	US WEST, Thwaits, Tom	1
RGU11-16	US WEST, Esterday, Terrance	1
RGU11-2	US WEST, Chivers, Dawn	1
RGV55-1	VION CORPORATION, Frana, Tom	1
RGW22-3	WHEAT INT'L COMMUNICATION CORP, Biciocch	1
RT50-05	TITAN CORPORATION, Wisniewski, Helena S.	1
ZINTERCOC	Z.. INTERNAL - NEW JERSEY, Janine,	3
ZINTERCOF	Z.. INTERNAL - VIRGINIA, RA's, Stock, Rp	25 +25
ZINTERCOG	Z.. INPUT KK, Library,	2
		~~77~~ 102 +stock

Code	Company	MM10 -RP
RGA04-20	AT&T GLOBAL INFORMATION, Sharp, John	2
RGB02-12	BOOZ-ALLEN & HAMILTON, Pelehach, Dennis	2
RGB03-16	BOEING INFORMATION SERVICES, Needham, Be	2
RGB29-15	BELL ATLANTIC FEDERAL SYSTEMS, Hecht-Kis	1
RGB29-33	BELL ATLANTIC, Guest, Robert S.	6
RGB29-45	BELL ATLANTIC, Callahan, Dennis	1
RGC38-2	COMPREHENSIVE TECHNOLOGIES INT, Hall, Ja	2
RGC38-5	COMPREHENSIVE TECHNOLOGY, Brittingham, M	1
RGC40-34	CACI, INC., Gostel, Mary	1
RGC40-42	CACI, INC., Parker, Bill	1
RGC62-2	COMPAQ COMPUTER CORPORATION, Newgaard, G	2
RGC62-8	COMPAQ COMPUTER CORPORATION, Diamond, Fr	1
RGD01-21	DIGITAL EQUIPMENT CORPORATION, Spitbrook	1
RGD01-23	DIGITAL EQUIPMENT CORPORATION, Koscielni	1
RGD01-44	DIGITAL EQUIPMENT CORPORATION, Breeding,	1
RGD01-58	DIGITAL EQUIPMENT CORPORATION, Dyson, Tr	2
RGD27-44	DELL COMPUTER CORPORATION, Funk, George	2
RGE38-1	E-SYSTEMS, INC.(GARLAND DIV.), Reinkemey	1
RGF99-1	FORTRAN CORPORATION, Meador, Linda	1
RGG02-6	GTE GOVERNMENT SYSTEMS, Slepian, Carina	1
RGG04-1	GOVERNMENT TECHNOLOGY SVC/GTSI, Pesheck,	2
RGG05-10	NORTHROP-GRUMMAN, Calavas, Steve	1
RGG18-14	MINDSET INC., Forest, Chris	1
RGH04-40	HEWLETT-PACKARD, Creighton, Pat	1
RGI01-24E	IBM PC COMPANY, Jones, Stefanie	1
RGI01-36A	IBM FEDERAL SYSTEMS, Marquardt, Neil	2
RGL14-14	LOCKHEED MARTIN ENG. & SCIENCE, Saltsman	1
RGL14-2	LOCKHEED MARTIN, Stock, Richard	1
RGM01-1	LOCKHEED MARTIN INFO. SYSTEMS, Burgess,	1
RGM01-18	LOCKHEED MARTIN INFO. SYSTEMS, Sihler, B	1
RGM16-12	MOTOROLA, Powell, Robert	1
RGM29-2	MITRE CORPORATION, THE, Kersch, Beth	1
RGM29-3	MITRE CORPORATION, THE, Roth, Beth	1
RGN04-44	NORTEL, Jones, Larry	1
RGN105-1	N.E.T. FEDERAL, Clarkson, Thomas	2
RGN93-2	NETWORK GENERAL CORPORATION, Knapp, Rick	1
RGP14-6	PRICE WATERHOUSE, Killam, Michael	1
RGS56-1	SKYTEL CORPORATION, Spohn, George	1
RGS56-2	SKYTEL CORPORATION, Moore, Susan	1
RGS57-1	STG MARKETING COMMUNICATIONS, Gosselin,	1
RGT07-4	TEXAS INSTRUMENTS, Orginz, Harold	1
RGT21-1	TASC, Himmelberger, Peter	1
RGU11-1	US WEST COMMUNICATIONS, Smith, Karen	1
RGU11-14	US WEST, Thwaits, Tom	1
RGU11-16	US WEST, Esterday, Terrance	1
RGU11-2	US WEST, Chivers, Dawn	1
RGV55-1	VION CORPORATION, Frana, Tom	1
RGV55-2	VION CORPORATION, Jennings, Shelley	1

Code	Company	MM10 -RP
RGW22-3	WHEAT INT'L COMMUNICATION CORP, Biciocch	1
RT50-05	TITAN CORPORATION, Wisniewski, Helena S.	1
ZINTERCOA	Z.. INTERNAL - CALIFORNIA, **Judy**, Sal	1
ZINTERCOB	Z.. INTERNAL - CALIFORNIA, Library,	2
ZINTERCOC	Z.. INTERNAL - NEW JERSEY, Janine,	2
ZINTERCOF	Z.. INTERNAL - VIRGINIA, RA's, Stock, Rp	10
ZINTERCOG	Z.. INPUT KK, Library,	2
ZINTERCOL	Z..REGISTER OF COPYRIGHTS, Dep & Acq Div	2
ZINTERCOM	Z.. INTERNAL - VIRGINIA, MMAR, PROGRAM M	1
		85

88

+ Stock

BOOK BINDING LAYOUT

Date 1-2-96
Project Code MM10
Title Executive Overview
Fulfillment Quantity ______ Stock Quantity 50 TOTAL Quantity ______

☐ GBC Soft Vinyl
☒ Hotstrip
☐ Soft Vinyl Window
☒ 80# White
☐ Colored Cardstock Window
☐ Binder—Drill holes ____
☐ Shrink Wrap

Color Cover White
Paper White

EXHIBIT F

COVER	To our Clients	Abstract	(Blank) X	Overview Contents	(Blank) X	Executive Overview	1 → 10	TOC	i → iv	Exhibits	v → vi
Program Description	Program Deliverables	X	About INPUT								

ADM 480/01 10/94 INPUT

Report Quality Evaluation

To our clients:

To ensure that the highest standards of report quality are maintained, INPUT would appreciate your assessment of this report. Please take a moment to provide your evaluation of the usefulness and quality of this study. When complete, simply fax to INPUT at (415) 961-3966 or fold, tape, and drop in the mail. Postage has been pre-paid by INPUT if mailed in the U.S.

Thank You.

1. Report title: **Federal Wireless Technology Market 1995-2000 (MM10)**

2. Please indicate your reason for reading this report:
   - ☐ Required reading
   - ☐ Area of high interest
   - ☐ Area of general interest
   - ☐ New product development
   - ☐ Business/market planning
   - ☐ Product planning
   - ☐ Future purchase decision
   - ☐ Systems planning
   - ☐ Other ____________________

3. Please indicate extent report used and overall usefulness:

	Extent		**Usefulness (1=Low, 5=High)**				
	Read	Skimmed	1	2	3	4	5
Executive Overview	☐	☐	☐	☐	☐	☐	☐
Complete report	☐	☐	☐	☐	☐	☐	☐
Part of report (_____ %)	☐	☐	☐	☐	☐	☐	☐

4. How useful were:

Data presented	☐	☐	☐	☐	☐
Analyses	☐	☐	☐	☐	☐
Recommendations	☐	☐	☐	☐	☐

5. How useful was the report in these areas:

Alert you to new opportunities or approaches	☐	☐	☐	☐	☐
Cover new areas not covered elsewhere	☐	☐	☐	☐	☐
Confirm existing ideas	☐	☐	☐	☐	☐
Meet expectations	☐	☐	☐	☐	☐
Other ______________________________	☐	☐	☐	☐	☐

6. Which topics in the report were the most useful? Why? ____

7. In what ways could the report have been improved? ____

8. Other comments or suggestions: ____

Name ____________________ Title ____________________

Department ____________________ Company ____________________

Address ____

____________________ Country ____________________

Telephone ____________________ Date completed ____________________

Thank you for your time and cooperation.

M&S 633/01 10/94

INPUT

January 2, 1996

Dear Colleague:

Enclosed is INPUT's report entitled, *Federal Wireless Technology Market **1995–2000**,* issued as a part of INPUT's Federal Information Technology Program.

The report's findings are based on analysis of agency programs, OMB and agency *Five-Year Information Technology Plans for **1995–2000**,* and agency and vendor interviews. The report focuses on document management systems products and services and is designed to help vendors plan their strategies to compete for federal document management system contracts. This report was prepared in response to client interest in this market and identifies market issues and trends.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,

Scott W. Lewis
Vice-President

EXHIBIT G
(ADM405)

INPUT®

DESKTOP PUBLISHING PROCESSING CHECKLIST

Report Name: Federal Wireless Technology Market 1995-2000 **Code:** MM10

- ✓ ☐ Cover and spine art with copy of back of Report Production QC Schedule ADM400/02 for Printing/Binding Specifications

- ☑ Report with *blue sheet*—Report Production QC Schedule ADM400/01
  - ☑ Title page
  - ☑ About INPUT
  - ☑ Abstract
  - ☑ Copyright
  - ☑ Table of Contents
  - ☑ List of Exhibits
  - ☑ All chapters
  - ☑ Appendixes
- ☑ Book Binding Layout form (ADM480)
- ☑ Evaluation Form (M&S633/01)

- ☑ Executive Overview
  - ☑ Cover
  - ☑ *To Our Clients*...page
  - ☑ Abstract
  - ☑ Overview Contents
  - ☑ Executive Overview chapter (usually chapter 2)
  - ☑ Table of contents from report
  - ☑ List of Exhibits from report
  - ☑ Two page program description
  - ☑ Blank page
  - ☑ About INPUT
  - ☑ Book Binding Layout form

- ☑ 2 copies of the transmittal letter to clients
- ☑ Copy of back of Report Production QC Schedule labeled for *shipping*
- ☑ Evaluation form
- ☑ Any disks to be shipped with report

☑ Completed Initial: ____________ Date: 1-2-96

ADM405/01
10/94

January 2, 1996

Dear Colleague:

Enclosed is INPUT's report entitled, *Federal Wireless Technology Market 1995–2000*, issued as a part of INPUT's Federal Information Technology Program.

The report's findings are based on analysis of agency programs, OMB and agency *Five-Year Information Technology Plans for 1995–2000*, and agency and vendor interviews. The report focuses on document management systems products and services and is designed to help vendors plan their strategies to compete for federal document management system contracts. This report was prepared in response to client interest in this market and identifies market issues and trends.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,

Scott W. Lewis
Vice-President

INPUT®

EXECUTIVE OVERVIEW

Federal Wireless Technology Market 1995–2000

Federal IT Market Analysis Program

To Our Clients:

This summary is an excerpt from a full research report, ***Federal Wireless Technology Market 1995–2000,*** issued as part of INPUT's Federal IT Market Analysis Program. A complete description of the program is provided at the end of this Executive Overview.

If you have questions or comments about this report, please call (703) 847-6870 to contact your INPUT analyst.

Abstract

INPUT expects the federal government market demand for wireless products and services, based on communications budgets, to grow from $55 million in FY1995 to $65 million in FY2000. This represents a compound annual growth rate (CAGR) of 3%. The growth rate would be higher if industry can convince agency buyers that products can satisfy requirements for security and reliability first in the commercial arena.

The *Federal Wireless Technology Market 1995–2000* provides an overview of the developments and opportunities in this market. This report identifies agency levels of interest in wireless technologies and the products and services that are planned to be purchased. It discusses vendor trends and issues and provides profiles of vendors competing in the market. The report compares agency and vendor perceptions of the market, and offers recommendations for vendors interested in expanding their market share.

This report contains 96 pages including 25 exhibits.

Overview Contents

Executive Overview

A. Agency Issues 2
B. Federal Wireless Technology Spending 4
C. Market Forecast 5
D. Benefits and Liabilities 6
E. Vendor Perspectives 7
F. Recommendations 9

Report Table of Contents i
Report Exhibits List v
Program Description vii

Executive Overview

All areas of wireless technology selected by INPUT for detailed investigation show promising growth potential. Interest in and implementation of wireless technologies reported by twenty-eight different agencies are represented in this report. Analysis in this study has focused on these agencies because of their specific operational requirements and relevance of these requirements to wireless technologies. Conclusions may not be relevant to all federal agencies.

The six major product and service categories highlighted are defined below:

1. Paging, Faxing and E–mail

The primary distinction of paging systems is their design as one-way communications. Faxing and E–mail are similar to paging in that they can be answered later using another medium.

2. Specialized Mobile Radio Systems (SMR)

Specialized Mobile Radio allows multiple users to operate on what appears to be a private radio channel but in practice is shared by perhaps hundreds of users. Today's SMR services include direct-dial telephone connections, paging services, and data transmission.

3. Two-Way Data Only

Three Two-Way Data Only systems described in detail in this report are ARDIS, RAM Mobile Data and the National Wireless Network (NWN). Any of these systems can compete on a functional basis with any wireless data-only service, including cellular or satellite paging services.

4. Cellular

Cellular systems are referred to simplistically as multiple, interconnected repeater sites. They provide predominately voice and some data capabilities through mobile and portable wireless devices.

5. Personal Communications Systems (PCS)

PCS planned method of transmission is that of digital cellular services allowing people, wherever they are, to make calls or transfer data.

6. Wireless Local Area Networks (WLANs)

This application uses either radio frequency (RF) or infrared (IR) transmission products as part of an overall LAN communications architecture.

A

Agency Issues

Findings of the survey indicate paging, faxing, E–mail and cellular to be the most popular wireless applications, with virtually all respondents indicating present use of these technologies. Paging received most attention within the first of the six categories; wireless fax efficiency and ability to survive in the market was questioned. Federal wireless trends across all products and services show a steady increase over the next five years.

Exhibit 1 shows a ranking of projected use of wireless technologies across all applications identified by respondents in this study. All categories show increases in anticipated spending, in spite of overall reductions in government operating budgets.

Exhibit 1

Ranking of Projected Use of Wireless Technologies

- Paging, Faxing, E–mail
- Cellular
- Personal Communication Services (PCS)
- Specialized Mobile Radio (SMR)
- Two-Way Data Only
- Wireless Local Area Network (WLANs)

The most popular means by which interviewed agencies expect to obtain wireless products and services for now and in the future is through competitive procurements. This is consistent with requirements for full and open competition in the Federal Acquisition Regulations (FAR) and Competition in Contracting Act.

One half of the responding agencies indicated that they obtain technologies directly from a vendor. Direct sales by vendors may diminish in the future as wireless advances from a pilot stage to a requirements stage. Increased quantity purchases will raise the dollar value above competitive threshold and increased competitive alternatives will decrease opportunities for vendors who sell only a few products at a time. Currently product purchases are prevalent, but in the future, agencies will be looking for more complex solutions from integrators in a market with more teaming requirements and less single providers of products and services.

When agencies consider guidelines and directives, they have available several different sources. Industry-wide standards offer the broadest scope and reflect the greatest potential for assuring interoperability beyond immediate operating environments. Government-wide, then agency-wide, then program specific move progressively toward more specialized applicability and away from requirements for interoperability.

For now, government-wide standards have the greatest prominence for federal wireless users. The commercial marketplace will be influential in determining standards for common usage in most federal agencies. Federal vendors should take this opportunity to

influence the acceptance of commercial standards, especially within the many agencies that have no specific directives or guidelines.

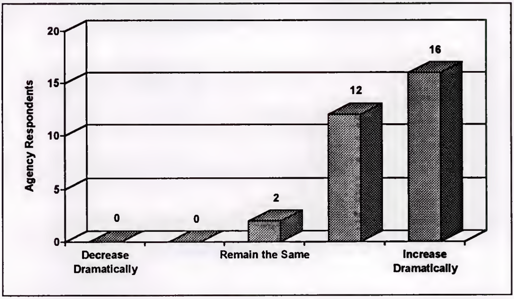
B

Federal Wireless Technology Spending

Growth in planned federal spending on wireless technologies over the next five years is favorable. Responses by agencies show a dramatic unanimous belief that spending for wireless solutions over the next five years will increase, as shown in Exhibit 2.

Exhibit 2

Planned Federal Spending on Wireless, FY1995-2000



Number of Respondents=30

Although funding, in general, for federal programs is declining, almost all of the 30 respondents indicated spending increases for wireless products and services. Those agencies experiencing budget cuts may actually be rich potential wireless markets. Operational uncertainties that prevail for agencies with programs subject to 1996 appropriations bills still in dispute in Congress, do not seem to affect dedication to wireless technology implementation.

Even though interviewed agencies expressed an overwhelming sense of increase in spending for wireless, it is not clear what the funding source of that increase will be. Although there is a slight inclination toward IT as the source of wireless funding over the next five years, still one third of the responding agencies have indicated funding to come primarily from non-IT spending. Vendors

should not define the potential of the wireless market solely through IT budgets. There certainly is no consistent spending source across agencies.

C

Market Forecast

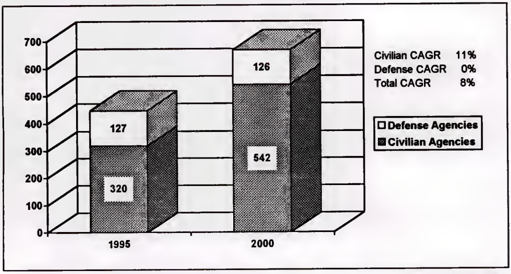
Vendors interested in the developments of the wireless technology market should begin by tracking the overall telecommunications industry. Complete communications (voice, data, or video) anytime to anywhere is the vision of the telecommunications market brought about by the continued merger of the communications and computing industries. Much of the enabling technology to achieve this vision is based on emerging technologies in wireless communications.

In terms of market forecasting, wireless communication is part of the larger category of communications. Because agencies do not specify exactly on what their communications dollars will be spent, it is necessary to look to this larger class to establish an outside boundary.

The overall communications market has been subdivided into relevant segments: hardware, professional services, and network services in order to understand spending levels in the communications market that address wireless technologies and services. The largest communications segment, leased circuits, is not included. Exhibit 3 shows anticipated growth of the communications submarket that contains wireless.

Exhibit 3

Federal Government Communications Product and Service Submarket, GFY 1995-2000



Figures in $ million

The wireless segment of the communications submarket is expected to grow from $55 million in GFY1995 to $65 million in GFY2000, at a CAGR of 3%. This apparent slow growth, as compared to the 8% CAGR for the overall submarket, is due largely to agency uncertainty of existing wireless products and not due to a limited potential of future products. Industry has the responsibility for assuring acceptable products and convincing agency planners to commit communication dollars to wireless solutions.

D

Benefits and Liabilities

Agency officials believe functional improvements to be the most beneficial use of wireless technologies. Exhibit 4 ranks the benefits expressed by agencies in this study. Functional improvements include capabilities for access, performance and deployability that we have not had in the past or we can now do better.

Exhibit 4

Ranking of Benefits and Liabilities to Wireless Use

BENEFITS	LIABILITIES
Functional Improvements	Product Quality
Operational Benefits	Cost
Support Human Mobility	Security
Infrastructure Efficiency	Employee Training
Savings (cost and time)	Other

Although product quality is ranked highest from an agency perspective among liabilities, the issue of cost is almost as highly ranked. The actual cost for wireless products and services is not the only agency concern involved with this issue. Agency respondents also expressed concern in developmental and technology transfer costs as well as continuing contract costs built into what appears to be an initial, defined requirement.

In general, agencies feel that wireless technologies will be a great benefit to field agents, distant sites, and frequent travelers, providing mobile offices and efficient exchange of information with anyone, anywhere and at anytime. Increased employee productivity and better service have definitely been highlighted as underlying priorities. However, agencies have additional concerns within the following areas:

- Lack of standards (in government and industry)
- Lack of proper cellular cites and infrastructure
- Lack of technology choices and competition
- Gradual increase in agency dependency on the private sector.

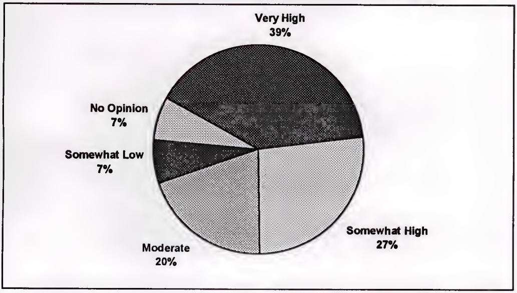
E

Vendor Perspectives

Vendor perspective of the federal wireless technology market growth potential over the next five years is shown in Exhibit 5.

Exhibit 5

Vendor Perspective of Market Growth Potential



Number of Responding Vendors=15

In comparison to agency planned spending, vendors are slightly less optimistic of the federal market potential for wireless technology. The 39% of responding vendors who qualified federal wireless technology with the highest possible growth potential is slightly lower than the 53% of agency respondents who indicated dramatic increases in federal wireless spending within the same time period. It is significant that 86% of responding vendors believed there would be at least a moderate growth in the federal wireless market.

Key factors that would contribute to this growth or non-growth of the federal wireless technology market, according to vendors, are grouped in Exhibit 6.

Exhibit 6

Key Factors Affecting the Federal Wireless Market

- Market Characteristics
- Security
- Product Quality
- Cost
- Standards

Market characteristics were ranked highest in influencing wireless technology growth within the federal government. Vendors believe that, in general, federal wireless market growth will depend on need and acceptance, whether in local government activities or extended globally (especially in military communication). Product quality, along with issues of security and cost, will be reflected in market characteristics important in projecting need for wireless technology and its acceptance into the marketplace.

Surprisingly, very few agencies were identified by vendors as offering attractive wireless opportunities, especially those agencies that have ideal environments for wireless implementation or have expressed definite wireless needs. Vendors see federal wireless opportunities to be in relatively few operating environments: military and law enforcement. As the market evolves, it is inevitable that defense activities, encompassing an enormous employee base, will have a strong impact on the direction and success of this market. However, most new wireless opportunities will be found in civilian agencies.

The current focus for wireless vendors is on markets already defined. A later focus will be on the bulk of agency wireless requirements when they materialize. Moderate teaming success currently recorded by vendors will rise as relationships defining success are identified and established.

F

Recommendations

Vendors can influence the wireless technology market in two important areas:

1. Influence Standards and Directives

   Government-wide standards have greater prominence among federal wireless users for now, but agency-wide and program level standards will be more significant to technology and competition. Few standards at the agency and program level are yet in place.

2. Influence Specifications

   Federal opportunities for wireless products and services depend to a certain extent on how well procuring agencies state specifications that describe functionality rather than specific technologies. Functional specification allows vendors to compete with variations in technology to provide the best service to an agency.

Government in general views wireless technology as a sound investment, but agencies are asking themselves what the most efficient means of communication is while keeping costs down. The first step is to identify what agencies want. Then effective standards, followed by price reductions, can fall into place. The best way to define agency needs is through cooperative development efforts and technology experimentation in the federal marketplace.

Aside from various product quality improvements, consolidation of services is becoming significant to wireless users. Vendors should watch the competition closely among companies that sell single mobile devices that integrate voice, data and paging. As competition increases and products evolve, wireless users will require consolidation of services.

Now is the time for vendors to step forward with their products and services; that is, as standards still are being defined and while the opportunity exists to become visible in federal agencies before identities are diluted by competition.

Table of Contents

I Introduction I-1

A. Scope I-2
B. Objectives I-2
C. Definitions I-3
  1. Paging, Faxing and E–mail I-4
  2. Specialized Mobile Radio Systems (SMR) I-4
  3. Two-Way Data Only I-4
  4. Cellular I-4
  5. Personal Communications Systems (PCS) I-4
  6. Wireless Local Area Networks (WLANs) I-5
D. Methodology I-5
E. Report Structure I-7
F. Related INPUT Reports I-8

II Executive Overview II-1

A. Agency Issues II-2
B. Federal Wireless Technology Spending II-4
C. Market Forecast II-5
D. Benefits and Liabilities II-6
E. Vendor Perspectives II-7
F. Recommendations II-9

III Market Definitions and Characteristics III-1

A. Paging, Faxing and E–mail III-1
B. Specialized Mobile Radio III-2
C. Two-Way Data Only III-3
  1. ARDIS III-4
  2. RAM Mobile Data III-4
  3. Nationwide Wireless Network III-4

D. Cellular III-5
1. Data Over Analog Cellular III-5
2. CDPD III-6
E. Personal Communications Services III-7
1. Broadband PCS III-7
2. Narrowband PCS III-7
3. Unlicensed PCS III-8
F. Wireless Local Area Networks III-8

IV Survey Findings IV-1
A. Implementation of Wireless Technology IV-2
B. Obtaining Wireless Technologies IV-5
C. Agency Spending on Wireless Technology IV-7
D. Agency Guidelines for Wireless Technology IV-10
1. Program Specific IV-11
2. Agency-wide IV-11
3. Government-wide IV-11
4. Industry IV-12
5. External Influences IV-12
E. Factors Influencing the Use of Wireless Technologies IV-12
1. Federal Wireless Technology Benefits IV-13
2. Federal Wireless Technology Liabilities IV-14

V Vendor Trends and Issues V-1
A. Vendor Performance V-1
B. Growth Potential of Federal Wireless Market V-3
C. Factors Affecting Growth V-4
D. Agencies Providing the Most Attractive Opportunities V-5
E. Competitive Advantages in the Federal Market V-6
F. Product and Service Value V-7
G. Teaming Patterns V-8
1. Teaming Efforts V-8
2. Teaming Partners V-9

VI Market Analysis and Forecast VI-1
A. Communications Market Forecast VI-1
B. Wireless Market Forecast VI-5
C. Summary VI-6

VII Conclusions and Recommendations VII-1
A. Influence Standards and Directives VII-2
B. Influence Specifications VII-3
C. Summary VII-3

A Federal Agency Respondent Profile A-1

B Letter to Agencies Interviewed B-1

C Vendor Profiles C-1
A. Paging, Faxing and E–mail C-1
B. Specialized Mobile Radio C-2
C. Two-Way Data Only C-3
D. Cellular C-4
E. Personal Communications Services C-5
F. Wireless Local Area Networks C-6

D Participating Vendors D-1

E Glossary of Federal Acronyms E-1

F Questionnaires F-1

(Blank)

Exhibits

II

-1 Ranking of Projected Use of Wireless Technologies II-3
-2 Planned Federal Spending on Wireless, FY 1995-2000 II-4
-3 Federal Government Communications Product and Service Submarket, FY 1995-2000 II-6
-4 Ranking of Benefits and Liabilities to Wireless Use II-7
-5 Vendor Perspective of Market Growth Potential II-8

III

-1 Companies Offering Wireless LAN Services III-9

IV

-1 Current and Planned Use of Federal Wireless Technology IV-3
-2 How Wireless Technologies Are Obtained IV-5
-3 Planned Federal Spending on Wireless IV-7
-4 Wireless Technology Spending (IT vs. non-IT) IV-8
-5 Scope of Directives and Guidelines IV-10
-6 Benefits of Wireless Technology IV-13
-7 Liabilities of Wireless Technology IV-15

V

-1 Wireless Technologies Provided by Vendor V-2
-2 Vendor Perspective of Market Growth Potential V-3
-3 Key Factors Affecting the Federal Wireless Market V-4
-4 Where Are the Most Attractive Opportunities? V-5
-5 How Vendors Can Increase Product and Service Value V-7
-6 Success Through Teaming Efforts V-8
-7 Frequency of Teaming Partnerships V-9

VI

-1 Overall Federal Government Communications Market VI-2
-2 Federal Government Communications Hardware Submarket VI-3
-3 Federal Government Communications Professional Services Submarket VI-4
-4 Federal Government Communications Network Services Submarket VI-4
-5 Federal Government Wireless Communications Submarket VI-5

About INPUT

INPUT is an independent, international market research and consulting firm serving the information technology industry. It focuses on the systems, software and services aspects of this worldwide industry. Clients continually receive analyses and forecasts of industry opportunities and trends.

Using *intelligence* (the gathering of information in an organized manner), INPUT generates *knowledge* based on an understanding of the industry. In this context, the capabilities and real-world experience of its staff are essential catalysts.

INPUT's proprietary research methodology and processes have evolved over 20 years, and generated consistent, verifiable, quantitative and qualitative findings.

The staff collects data through primary research. Data is examined and analyzed to produce information—information and opinion based on understanding form the knowledge base for client services.

INPUT provides information analysis and direction for planners, users and vendors. Clients receive services through:

- **Subscription services**
- **Custom research and consulting projects**
- **Acquisition services and support**
- **Electronic databases**
- **Research-based reports and newsletters**

Formed as a privately held corporation in 1974, INPUT has become a key source of information and support for many of the world's leading systems and services companies.

Frankfurt
Sudetenstraße 9
D-35428 Langgöns-Niederkleen
Germany
Tel. +49 6403911420
Fax +49 6403911413

London
Cornwall House
55-77 High Street
Slough
Berkshire SL1 1DZ
England
Tel. +44 1753 530 444
Fax +44 1753 577 311

New York
400 Frank W. Burr Blvd.
Teaneck, NJ 07666
U.S.A.
Tel. 1 (201) 801-0050
Fax 1 (201) 801-0441

Paris
24, avenue du Recteur Poincaré
75016 Paris
France
Tel. +33 (1) 46 47 65 65
Fax +33 (1) 46 47 69 50

San Francisco
1881 Landings Drive
Mountain View
CA 94043-0848
U.S.A.
Tel. 1 (415) 961-3300
Fax 1 (415) 961-3966

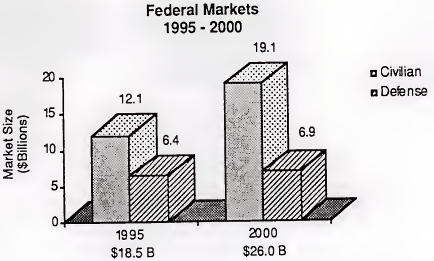
Tokyo
Saida Building, 4-6,
Kanda Sakuma-cho
Chiyoda-ku, Tokyo 101
Japan
Tel. +81 3 3864-0531
Fax +81 3 3864-4114

Washington, D.C.
1921 Gallows Road
Suite 250
Vienna, VA 22182
U.S.A.
Tel. 1 (703) 847-6870
Fax 1 (703) 847-6872

Federal IT Market Analysis Program

Continuous
Information
Services

Provides comprehensive market analysis and forecast of U.S. federal government IT expenditures for the next five years in support of client strategic planning.



INPUT reviews and analyzes proposed IT expenditures for hundreds of buying sites. INPUT's analysis allows you to examine the impacts of the hottest issues in the federal arena; develop appropriated long-range strategies and take advantage of the constantly changing marketplace; answer these questions and more:

- What new IT growth markets are emerging in the federal government?
- How will NPR impact the federal government network services market?
- On what agencies should you concentrate for software development over the next five years?
- What accounts for the growth in the intelligent workstation market within the Department of Defense?
- What systems integration submarkets will have the greatest growth rate, by agency?

1921 Gallows Road
Suite 250
Vienna, Virginia
22182-3900
Tel. (703) 847-6870
Fax (703) 847-6872

Program Deliverables

Market Forecast Report

Annual analysis and 5-year forecast of IT expenditures for federal government agencies. Published during the government's fourth quarter, the report subdivides the IT market into 12 services modes, forecasted for individual agencies.

Quarterly Strategic Perspective Reports

Reports analyze markets and significant driving events on topics of current interest:

- Telecommunications/E-mail
- High-Performance Computing
- Network Management
- Business Process Re-engineering

Agency Profiles

By analyzing federal government strategic IT plans and future acquisitions of agencies, INPUT develops and publishes profiles along with IT forecasts for 20 agencies with the largest IT budgets. INPUT clients also have access to buying profiles of hundreds of agency sites.

Monthly Research Bulletins

Analysis of each major event occurring in the IT market. INPUT's opinions of the impact on current and future federal agency requirements and acquisitions are published.

Support Services

- *Consultant Access* – Contact INPUT consultants for answers to your specific questions.
- *On-Site Briefings* – Bring INPUT's researchers to your location to educate your sales and marketing department, help focus business development, and speak to your clients and/or investors, etc.
- *INPUT Information Center* – Access extensive files on IT vendors, trade publications, subscription reports and on-line databases.
- *Executive Federal Conference* (2 seats) – Discuss key industry issues with INPUT analysts along with other industry experts and network with your peers.

1995

Federal Wireless Technology Market

1995–2000

INPUT®

Frankfurt • London • New York • Paris • San Francisco • Tokyo • Washington D.C.

Abstract

INPUT expects the federal government market demand for wireless products and services, based on communications budgets, to grow from $55 million in FY1995 to $65 million in FY2000. This represents a compound annual growth rate (CAGR) of 3%. The growth rate would be higher if industry can convince agency buyers that products can satisfy requirements for security and reliability first in the commercial arena.

The *Federal Wireless Technology Market 1995–2000* provides an overview of the developments and opportunities in this market. This report identifies agency levels of interest in wireless technologies and the products and services that are planned to be purchased. It discusses vendor trends and issues and provides profiles of vendors competing in the market. The report compares agency and vendor perceptions of the market, and offers recommendations for vendors interested in expanding their market share.

This report contains 96 pages including 25 exhibits.

Research by
INPUT
1921 Gallows Road, Suite 250
Vienna, VA 22182-3900
U.S.A.

Published by
INPUT
1881 Landings Drive
Mountain View, CA 94043-0848
U.S.A.

Federal IT Market Analysis Program

Federal Wireless Technology Market 1995–2000

Copyright © 1995 by INPUT. All rights reserved. Printed in the United States of America. No part of the publication may be reproduced or distributed in any form, or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

The information provided in this report shall be used only by the employees of and within the current corporate structure of INPUT's clients, and will not be disclosed to any other organization or person including parent, subsidiary, or affiliated organization without prior written consent of INPUT.

INPUT exercises its best efforts in preparation of the information provided in this report and believes the information contained herein to be accurate. However, INPUT shall have no liability for any loss or expense that may result from incompleteness or inaccuracy of the information provided.

MM10 • 719 • 1995

Table of Contents

I Introduction I-1
A. Scope I-2
B. Objectives I-2
C. Definitions I-3
1. Paging, Faxing and E–mail I-4
2. Specialized Mobile Radio Systems (SMR) I-4
3. Two-Way Data Only I-4
4. Cellular I-4
5. Personal Communications Systems (PCS) I-4
6. Wireless Local Area Networks (WLANs) I-5
D. Methodology I-5
E. Report Structure I-7
F. Related INPUT Reports I-8

II Executive Overview II-1
A. Agency Issues II-2
B. Federal Wireless Technology Spending II-4
C. Market Forecast II-5
D. Benefits and Liabilities II-6
E. Vendor Perspectives II-7
F. Recommendations II-9

III Market Definitions and Characteristics III-1
A. Paging, Faxing and E–mail III-1
B. Specialized Mobile Radio III-2
C. Two-Way Data Only III-3
1. ARDIS III-4
2. RAM Mobile Data III-4
3. Nationwide Wireless Network III-4

D. Cellular III-5
  1. Data Over Analog Cellular III-5
  2. CDPD III-6
E. Personal Communications Services III-7
  1. Broadband PCS III-7
  2. Narrowband PCS III-7
  3. Unlicensed PCS III-8
F. Wireless Local Area Networks III-8

IV Survey Findings IV-1
A. Implementation of Wireless Technology IV-2
B. Obtaining Wireless Technologies IV-5
C. Agency Spending on Wireless Technology IV-7
D. Agency Guidelines for Wireless Technology IV-10
  1. Program Specific IV-11
  2. Agency-wide IV-11
  3. Government-wide IV-11
  4. Industry IV-12
  5. External Influences IV-12
E. Factors Influencing the Use of Wireless Technologies IV-12
  1. Federal Wireless Technology Benefits IV-13
  2. Federal Wireless Technology Liabilities IV-14

V Vendor Trends and Issues V-1
A. Vendor Performance V-1
B. Growth Potential of Federal Wireless Market V-3
C. Factors Affecting Growth V-4
D. Agencies Providing the Most Attractive Opportunities V-5
E. Competitive Advantages in the Federal Market V-6
F. Product and Service Value V-7
G. Teaming Patterns V-8
  1. Teaming Efforts V-8
  2. Teaming Partners V-9

VI Market Analysis and Forecast VI-1
A. Communications Market Forecast VI-1
B. Wireless Market Forecast VI-5
C. Summary VI-6

VII Conclusions and Recommendations VII-1
- A. Influence Standards and Directives VII-2
- B. Influence Specifications VII-3
- C. Summary VII-3

A Federal Agency Respondent Profile A-1

B Letter to Agencies Interviewed B-1

C Vendor Profiles C-1
- A. Paging, Faxing and E–mail C-1
- B. Specialized Mobile Radio C-2
- C. Two-Way Data Only C-3
- D. Cellular C-4
- E. Personal Communications Services C-5
- F. Wireless Local Area Networks C-6

D Participating Vendors D-1

E Glossary of Federal Acronyms E-1

F Questionnaires F-1

(Blank)

Exhibits

II

-1 Ranking of Projected Use of Wireless Technologies II-3
-2 Planned Federal Spending on Wireless, FY 1995-2000 II-4
-3 Federal Government Communications Product and Service Submarket, FY 1995-2000 II-6
-4 Ranking of Benefits and Liabilities to Wireless Use II-7
-5 Vendor Perspective of Market Growth Potential II-8

III

-1 Companies Offering Wireless LAN Services III-9

IV

-1 Current and Planned Use of Federal Wireless Technology IV-3
-2 How Wireless Technologies Are Obtained IV-5
-3 Planned Federal Spending on Wireless IV-7
-4 Wireless Technology Spending (IT vs. non-IT) IV-8
-5 Scope of Directives and Guidelines IV-10
-6 Benefits of Wireless Technology IV-13
-7 Liabilities of Wireless Technology IV-15

V

-1 Wireless Technologies Provided by Vendor V-2
-2 Vendor Perspective of Market Growth Potential V-3
-3 Key Factors Affecting the Federal Wireless Market V-4
-4 Where Are the Most Attractive Opportunities? V-5
-5 How Vendors Can Increase Product and Service Value V-7
-6 Success Through Teaming Efforts V-8
-7 Frequency of Teaming Partnerships V-9

VI

-1 Overall Federal Government Communications Market VI-2
-2 Federal Government Communications Hardware Submarket VI-3
-3 Federal Government Communications Professional Services Submarket VI-4
-4 Federal Government Communications Network Services Submarket VI-4
-5 Federal Government Wireless Communications Submarket VI-5

I

Introduction

The *Federal Wireless Technology Market 1995–2000* report has been prepared because of the growing importance of wireless products and services throughout the federal government. This publication is one of many deliverables under INPUT's Federal Information Technology Market Analysis Program (MAR). The MAR program consults to leading vendors in the information services industry through strategy development and execution to pursue business with the federal government.

This report identifies the current level of interest in wireless technologies within the federal government. Analysis is based primarily on a recent survey of federal communications officials and Information Resources Management executives. The survey has been conducted to determine the current and planned use of wireless products and services and the perceived benefits and challenges associated with their use.

This report provides vendors with an understanding of agency requirements and insight to better position themselves in recommending appropriate solutions for federal wireless implementation. Vendor development plans and perceptions of the federal wireless technology market, acquired through survey, also are included in the report. The executive summary of the report has been provided to both vendor and government participants involved with the data collection process to acquaint them with the activities and perceptions of their counterparts.

A

Scope

This report examines the use of wireless technologies in the federal government over a forecast period of fiscal years 1995 through 2000. Within this market, INPUT's areas of focus are:

- Present and planned use of the wireless technology in the federal government
- Present and future means by which wireless services and products will be obtained
- Existing and developing wireless communications requirements
- Perceived benefits and liabilities to the use of wireless technologies
- Vendor opportunities to influence requirements and support wireless implementation
- Planned federal spending for wireless technologies.

B

Objectives

This report sets out to describe wireless technologies, to assess the current and projected use of each technology in the federal market, to determine expected federal spending levels, to identify communications requirements, to capture agency concerns, and to provide an overview of vendors with market presence. The wireless technologies selected by INPUT for detailed investigation are:

- Paging, Faxing and E–mail
- Specialized Mobile Radio (SMR)
- Two-Way Data Only
- Cellular
- Personal Communications Systems (PCS)
- Wireless Local Area Networks (WLANs).

This report addresses the following issues:

- Which wireless products and services currently are being implemented in the federal government?
- What is the projected use of federal wireless technologies over the next five years?
- How are agencies currently obtaining wireless services and products and will this be consistent in the future?
- What is the size of the wireless market and how will it expand over the next five years?
- What portion of federal funding for wireless technology will be part of IT spending in contrast to non-IT spending?
- What barriers exist to implementing wireless technologies?
- What concerns in implementing wireless technologies do agencies have?
- What is most appealing to the federal government about wireless technology?
- What are the characteristics of new vendors and products entering the wireless market?
- How can vendors make their wireless products and services more valuable to the federal government?
- What is the level of success with teaming efforts for vendors in the federal wireless technology market?
- What is a vendor's most frequent type of teaming partnership?

C

Definitions

The six major wireless technology categories selected by INPUT for this study are defined briefly below. These products and services are discussed further in Chapter III's Market Definitions and Characteristics.

1. Paging, Faxing and E–mail

The primary distinction of paging systems is their design as one-way communications. Faxing and E–mail are similar to paging in that they can be answered later using another medium. With the completion of narrowband auctions, enhanced paging services take this communication process into the realm of two-way activity. Users once prompted by the beep of a paging device now have access to voice messages, E–mail, news, stock market quotes and more.

2. Specialized Mobile Radio Systems (SMR)

Specialized Mobile Radio was originally operational with dispatchers of trucking, police and taxi facilities. It allows multiple users to operate on what appears to be a private radio channel but in practice is shared by perhaps hundreds of users. With increased competition from cellular providers and the future PCS services, SMR providers are upgrading their networks to provide cellular-type services. Today's SMR services include direct-dial telephone connections, paging services, and data transmission.

3. Two-Way Data Only

Three Two-Way Data Only systems described in detail in this report are ARDIS, RAM Mobile Data and the National Wireless Network (NWN). Any of these systems can compete on a functional basis with any wireless data-only service, including cellular or satellite paging services.

4. Cellular

Cellular systems are referred to simplistically as multiple, interconnected repeater sites. They provide predominately voice and some data capabilities through mobile and portable wireless devices. The conversion to digital technology is in its early stages and enables more data services to be offered. Two technologies discussed in further detail are Cellular Digital Packet Data (CDPD) and Data over Analog Cellular.

5. Personal Communications Systems (PCS)

PCS is at least one year away from widespread availability in the United States. Its planned method of transmission is that of digital cellular services allowing people to make calls or transfer data

wherever they are. The PCS marketplace is a potential playing field for almost everyone, including the Regional Bell Operating Companies (ROBCs), local exchange carriers like GTE, long distance companies, cable TV companies, competitive access providers and start-up organizations.

6. Wireless Local Area Networks (WLANs)

While not a replacement for wired LANs, applications using either radio frequency (RF) or infrared (IR) transmission products have found their way into the overall LAN communications architecture. Users of wireless LANs can determine the appropriate type of transmission based on the distance to be spanned, the security and speed required, and the characteristics of the desired network location.

D

Methodology

This report was developed through a combination of primary and secondary research using several sources:

- Interviews with agency representatives
- Interviews with leading vendor professionals pursuing the federal wireless technology market
- Interviews with standards organizations
- Federal Agency FY1995 Information Technology Plans
- Federal requirements packages for wireless procurements
- Non-proprietary insights from custom research and consulting studies
- INPUT's research library file on technologies, agencies and vendors
- INPUT's Procurement Analysis Reports (PARs).

INPUT developed questionnaires for interviewing federal agency officials and wireless vendor executives. Discussions supplemented the structured survey relative to the interviewee's knowledge of wireless technologies and familiarity with application. Federal agency respondents included executives, program managers, and technical staff. These interviews provided a perspective across agencies from policy makers to users. Vendor representatives selected for interviews included company executives and high-ranking marketing personnel. Lists of the agencies and vendors surveyed are found in Appendixes A and D respectively. Actual questionnaires are found in Appendix F.

INPUT made inquiries of the wireless technology market of vendor and agency staff as well as regulating bodies, such as the Federal Communications Commission, the National Telecommunications and Information Administration and the National Institute of Standards and Technology. Determinations of federal attitudes, spending levels, implementation issues and long-range plans and requirements for communication improvements were made. Vendors of wireless technologies were interviewed to understand their market focuses, distribution channels, development plans for technology improvement, and perceptions of growth potential in the federal wireless market.

The resulting data were analyzed for trends and interrelationships and converted into information reflecting the attributes and tendencies of users and vendors.

INPUT considers the samples used commensurate with the conclusions drawn and has, where appropriate, adjusted the sample base to remove any undue bias that could result from unique or extreme responses, which otherwise could skew the findings as a result of a single sample.

Questionnaire responses and analyses for agencies are summarized in Chapter IV under Survey Findings. Similar information on wireless technology vendors can be found in Chapter V under Vendor Trends and Issues.

E

Report Structure

This report contains seven chapters and six Appendixes. The contents of the chapters following this introduction are as follows:

Chapter II - Executive Overview - offers an overview of the analysis conducted as part of the study and summarizes the major findings of the report. It is a brief summation of the most important issues, conclusions and recommendations.

Chapter III - Market Definitions and Characteristics - defines the six wireless product and service categories being investigated by INPUT in this report. It offers examples of companies with specific capabilities as well as general statements on federal application.

Chapter IV - Survey Findings - presents the results of the questionnaire completed by agency representatives. It provides analysis of the survey findings and other agency information reflecting requirements and trends in the federal wireless market.

Chapter V - Vendor Trends and Issues - provides vendor perspectives of the federal wireless market and discusses responses to the questionnaire completed by participating vendors. It compares vendor to agency perspectives in areas where similar issues are addressed.

Chapter VI - Market Analysis and Forecast - presents INPUT's forecast of the federal wireless market for fiscal years 1995 through 2000. It provides an overview of the market, planned government spending and factors impacting market conditions.

Chapter VII - Conclusions and Recommendations - offers INPUT's conclusions within the federal wireless market based on questionnaire responses, market forecasts, analysis and secondary research. Recommendations address a means by which wireless vendors can act upon the conclusions reached.

Appendixes A through *F* provide a list of federal agency respondents, wireless vendor profiles, list of participating vendors, glossary of federal acronyms, actual questionnaires used in conducting the interview process and the accompanying letter addressed to agency officials.

F

Related INPUT Reports

INPUT publishes several related reports as part of its MAR program, and each provides a unique perspective of the federal information technology market. Recent reports of interest to the reader are:

Federal Document Management Systems, FY1995–FY2000

Federal Information Systems and Services Market, FY1995–FY2000

Federal Computer Security Market, FY1995

Federal Telecommunications Market, FY1994–FY1999

Federal E–mail Systems Market, FY1995

Federal High Performance Computing Market, FY1994–FY1999.

INPUT also publishes annual commercial reports of interest to the reader. Those directly related to telecommunications are:

Wireless Telecommunications Marketplace - This report provides an overview of the developments and opportunities available in the dynamic wireless communications market with the discussion of emerging technologies for wireless delivery, regulatory concerns for market participants and market drivers and inhibitors.

Telecommunications Vertical Market Analysis - This report identifies key trends and issues affecting information services in the telecommunications marketplace, including telephone, cable TV, and broadcast service providers.

U.S. Network Services Market Forecast - This report is one in a series of annual market analysis reports that reviews network applications services including value-added networks, EDI, and electronic information interchange; and electronic information services that address on-line databases and news services.

Client/Server Applications Trends - Telecommunications Vertical Market Analysis - This report is one in a series of reports analyzing the trends in client/server applications by vertical market industry.

II

Executive Overview

All areas of wireless technology selected by INPUT for detailed investigation show promising growth potential. Interest in and implementation of wireless technologies reported by twenty-eight different agencies are represented in this report. Analysis in this study has focused on these agencies because of their specific operational requirements and relevance of these requirements to wireless technologies. Conclusions may not be relevant to all federal agencies.

The six major product and service categories highlighted are defined below:

1. Paging, Faxing and E–mail

The primary distinction of paging systems is their design as one-way communications. Faxing and E–mail are similar to paging in that they can be answered later using another medium.

2. Specialized Mobile Radio Systems (SMR)

Specialized Mobile Radio allows multiple users to operate on what appears to be a private radio channel but in practice is shared by perhaps hundreds of users. Today's SMR services include direct-dial telephone connections, paging services, and data transmission.

3. Two-Way Data Only

Three Two-Way Data Only systems described in detail in this report are ARDIS, RAM Mobile Data and the National Wireless Network (NWN). Any of these systems can compete on a functional basis with any wireless data-only service, including cellular or satellite paging services.

4. Cellular

Cellular systems are referred to simplistically as multiple, interconnected repeater sites. They provide predominately voice and some data capabilities through mobile and portable wireless devices.

5. Personal Communications Systems (PCS)

PCS planned method of transmission is that of digital cellular services allowing people, wherever they are, to make calls or transfer data.

6. Wireless Local Area Networks (WLANs)

This application uses either radio frequency (RF) or infrared (IR) transmission products as part of an overall LAN communications architecture.

A

Agency Issues

Findings of the survey indicate paging, faxing, E–mail and cellular to be the most popular wireless applications, with virtually all respondents indicating present use of these technologies. Paging received most attention within the first of the six categories; wireless fax efficiency and ability to survive in the market was questioned. Federal wireless trends across all products and services show a steady increase over the next five years.

Exhibit II-1 shows a ranking of projected use of wireless technologies across all applications identified by respondents in this study. All categories show increases in anticipated spending, in spite of overall reductions in government operating budgets.

Exhibit II-1

Ranking of Projected Use of Wireless Technologies

- Paging, Faxing, E–mail
- Cellular
- Personal Communication Services (PCS)
- Specialized Mobile Radio (SMR)
- Two-Way Data Only
- Wireless Local Area Network (WLANs)

The most popular means by which interviewed agencies expect to obtain wireless products and services for now and in the future is through competitive procurements. This is consistent with requirements for full and open competition in the Federal Acquisition Regulations (FAR) and Competition in Contracting Act.

One half of the responding agencies indicated that they obtain technologies directly from a vendor. Direct sales by vendors may diminish in the future as wireless advances from a pilot stage to a requirements stage. Increased quantity purchases will raise the dollar value above competitive threshold and increased competitive alternatives will decrease opportunities for vendors who sell only a few products at a time. Currently product purchases are prevalent, but in the future, agencies will be looking for more complex solutions from integrators in a market with more teaming requirements and less single providers of products and services.

When agencies consider guidelines and directives, they have available several different sources. Industry-wide standards offer the broadest scope and reflect the greatest potential for assuring interoperability beyond immediate operating environments. Government-wide, then agency-wide, then program specific move progressively toward more specialized applicability and away from requirements for interoperability.

For now, government-wide standards have the greatest prominence for federal wireless users. The commercial marketplace will be influential in determining standards for common usage in most federal agencies. Federal vendors should take this opportunity to

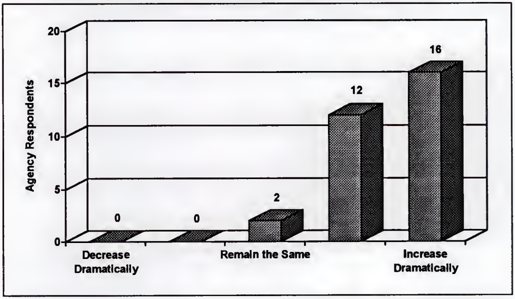
influence the acceptance of commercial standards, especially within the many agencies that have no specific directives or guidelines.

B
Federal Wireless Technology Spending

Growth in planned federal spending on wireless technologies over the next five years is favorable. Responses by agencies show a dramatic unanimous belief that spending for wireless solutions over the next five years will increase, as shown in Exhibit II-2.

Exhibit II-2

Planned Federal Spending on Wireless, FY1995–2000



Number of Respondents=30

Although funding, in general, for federal programs is declining, almost all of the 30 respondents indicated spending increases for wireless products and services. Those agencies experiencing budget cuts may actually be rich potential wireless markets. Operational uncertainties that prevail for agencies with programs subject to 1996 appropriations bills still in dispute in Congress, do not seem to affect dedication to wireless technology implementation.

Even though interviewed agencies expressed an overwhelming sense of increase in spending for wireless, it is not clear what the funding source of that increase will be. Although there is a slight inclination toward IT as the source of wireless funding over the next five years, still one third of the responding agencies have indicated funding to come primarily from non-IT spending. Vendors

should not define the potential of the wireless market solely through IT budgets. There certainly is no consistent spending source across agencies.

C

Market Forecast

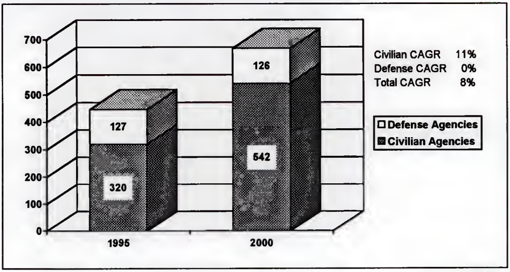
Vendors interested in the developments of the wireless technology market should begin by tracking the overall telecommunications industry. Complete communications (voice, data, or video) anytime to anywhere is the vision of the telecommunications market brought about by the continued merger of the communications and computing industries. Much of the enabling technology to achieve this vision is based on emerging technologies in wireless communications.

In terms of market forecasting, wireless communication is part of the larger category of communications. Because agencies do not specify exactly on what their communications dollars will be spent, it is necessary to look to this larger class to establish an outside boundary.

The overall communications market has been subdivided into relevant segments: hardware, professional services, and network services in order to understand spending levels in the communications market that address wireless technologies and services. The largest communications segment, leased circuits, is not included. Exhibit II-3 shows anticipated growth of the communications submarket that contains wireless.

Exhibit II-3

Federal Government Communications Product and Service Submarket, GFY 1995-2000



Figures in $ million

The wireless segment of the communications submarket is expected to grow from $55 million in GFY1995 to $65 million in GFY2000, at a CAGR of 3%. This apparent slow growth, as compared to the 8% CAGR for the overall submarket, is due largely to agency uncertainty of existing wireless products and not due to a limited potential of future products. Industry has the responsibility for assuring acceptable products and convincing agency planners to commit communication dollars to wireless solutions.

D

Benefits and Liabilities

Agency officials believe functional improvements to be the most beneficial use of wireless technologies. Exhibit II-4 ranks the benefits expressed by agencies in this study. Functional improvements include capabilities for access, performance and deployability that we have not had in the past or we can now do better.

Exhibit II-4

Ranking of Benefits and Liabilities to Wireless Use

BENEFITS	LIABILITIES
Functional Improvements	Product Quality
Operational Benefits	Cost
Support Human Mobility	Security
Infrastructure Efficiency	Employee Training
Savings (cost and time)	Other

Although product quality is ranked highest from an agency perspective among liabilities, the issue of cost is almost as highly ranked. The actual cost for wireless products and services is not the only agency concern involved with this issue. Agency respondents also expressed concern in developmental and technology transfer costs as well as continuing contract costs built into what appears to be an initial, defined requirement.

In general, agencies feel that wireless technologies will be a great benefit to field agents, distant sites, and frequent travelers, providing mobile offices and efficient exchange of information with anyone, anywhere and at anytime. Increased employee productivity and better service have definitely been highlighted as underlying priorities. However, agencies have additional concerns within the following areas:

- Lack of standards (in government and industry)
- Lack of proper cellular cites and infrastructure
- Lack of technology choices and competition
- Gradual increase in agency dependency on the private sector.

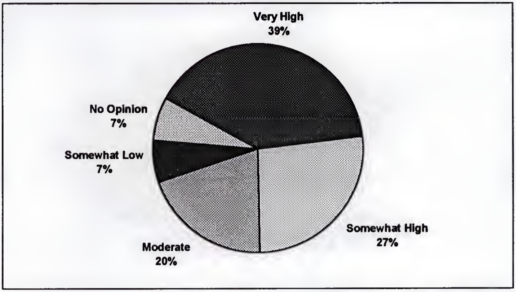
E

Vendor Perspectives

Vendor perspective of the federal wireless technology market growth potential over the next five years is shown in Exhibit II-5.

Exhibit II-5

Vendor Perspective of Market Growth Potential



Number of Responding Vendors=15

In comparison to agency planned spending, vendors are slightly less optimistic of the federal market potential for wireless technology. The 39% of responding vendors who qualified federal wireless technology with the highest possible growth potential is slightly lower than the 53% of agency respondents who indicated dramatic increases in federal wireless spending within the same time period. It is significant that 86% of responding vendors believed there would be at least a moderate growth in the federal wireless market.

Key factors that would contribute to this growth or non-growth of the federal wireless technology market, according to vendors, are grouped in Exhibit II-6.

Exhibit II-6

Key Factors Affecting the Federal Wireless Market

- Market Characteristics
- Security
- Product Quality
- Cost
- Standards

Market characteristics were ranked highest in influencing wireless technology growth within the federal government. Vendors believe that, in general, federal wireless market growth will depend on need and acceptance, whether in local government activities or extended globally (especially in military communication). Product quality, along with issues of security and cost, will be reflected in market characteristics important in projecting need for wireless technology and its acceptance into the marketplace.

Surprisingly, very few agencies were identified by vendors as offering attractive wireless opportunities, especially those agencies that have ideal environments for wireless implementation or have expressed definite wireless needs. Vendors see federal wireless opportunities to be in relatively few operating environments: military and law enforcement. As the market evolves, it is inevitable that defense activities, encompassing an enormous employee base, will have a strong impact on the direction and success of this market. However, most new wireless opportunities will be found in civilian agencies.

The current focus for wireless vendors is on markets already defined. A later focus will be on the bulk of agency wireless requirements when they materialize. Moderate teaming success currently recorded by vendors will rise as relationships defining success are identified and established.

F

Recommendations

Vendors can influence the wireless technology market in two important areas:

1. Influence Standards and Directives

   Government-wide standards have greater prominence among federal wireless users for now, but agency-wide and program level standards will be more significant to technology and competition. Few standards at the agency and program level are yet in place.

2. Influence Specifications

Federal opportunities for wireless products and services depend to a certain extent on how well procuring agencies state specifications that describe functionality rather than specific technologies. Functional specification allows vendors to compete with variations in technology to provide the best service to an agency.

Government in general views wireless technology as a sound investment, but agencies are asking themselves what the most efficient means of communication is while keeping costs down. The first step is to identify what agencies want. Then effective standards, followed by price reductions, can fall into place. The best way to define agency needs is through cooperative development efforts and technology experimentation in the federal marketplace.

Aside from various product quality improvements, consolidation of services is becoming significant to wireless users. Vendors should watch the competition closely among companies that sell single mobile devices that integrate voice, data and paging. As competition increases and products evolve, wireless users will require consolidation of services.

Now is the time for vendors to step forward with their products and services; that is, as standards still are being defined and while the opportunity exists to become visible in federal agencies before identities are diluted by competition.

III

Market Definitions and Characteristics

This section contains definitions of the six product and service categories that INPUT has selected for detailed investigation. Vendors providing specific services and products are identified throughout. At the end of each technology category is an overview of federal application.

A

Paging, Faxing and E–mail

Perhaps the highest level of convergence in computing and communications has come with paging, faxing and E–mail. For years, users have been prompted by the beep of a paging device. Today, those same users have access to voice messages, E–mail, news, stock market quotes, and more. The same information is accessible through a laptop, hand-held computing device, or Personal Digital Assistant (PDA).

The primary distinction of paging systems is their design as one-way communications devices; response to a page generally requires a different communications device, such as a telephone. Faxes and E–mail are similar in that they can be answered later using another medium. Paging also provides economical broadcast messaging. The same message can be sent to a group of pagers without having to re-key the information or to make multiple calls.

With the completion of narrowband auctions, enhanced paging service takes this communication process into the realm of two-way activity. This service allows the user to respond with a positive receipt of message acknowledgment and two-way messaging in

support of up to 300 characters both ways. An initial enhancement brings a voice mail message directly into the paging device.

Some companies offer paging, wireless messaging and faxing over private data networks. Coverage can be regional or national, as is the case with WyndMail using the RAM Mobile Data wireless packet network. However, many nationwide paging services use satellites to provide coverage. Among the companies offering these services are:

- Bell South's MobileComm
- Metrocall Inc.
- Motorola's EMBARC
- Mtel's SkyTel
- Paging Network Inc.'s PageNet.

Broadcast television and radio support paging by sharing a small portion of their transmitted bandwidth with paging companies. Interconnectivity occurs among these systems through a combination of traditional telephone and satellite links. The broadcast transmitters provide considerable expansion into markets that otherwise would not be profitable. These networks enable paging companies to offer nationwide service at favorable rates.

Almost all federal agencies currently are using pagers or paging services for their task-specific needs. Some have implemented or currently are developing a requirement for wireless E–mail. Others are planning for wireless E–mail use over the next year. On the contrary, wireless faxing is not a very popular means of communication and likewise is not emphasized in federal five year plans.

B

Specialized Mobile Radio

Specialized Mobile Radio (SMR) systems are based on technology allowing multiple users to operate on what appears to be a private radio channel but in practice is a communication channel shared by perhaps hundreds of users. Each user on the system "listens" to a

control channel. When a connection is requested, the controller selects a channel and changes the frequency of all units in the selected group, allowing them to communicate. That channel then cannot be accessed by any other user until the communication session is complete. SMR was originally operational in this manner with dispatchers of trucking, police and taxi facilities. Today's SMR services include direct-dial telephone connections, paging services, and data transmission.

With increased competition from cellular providers and future PCS services, SMR providers are upgrading their networks to include cellular-type services. The first step is providing digital services through the enhanced SMR (ESMR) equipment. ESMR users can receive integrated dispatch services, voice, messaging and paging. In April 1994, Motorola was the first company to announce ESMR devices for transmitting data, voice and fax.

SMR operators also are combining properties to provide greater coverage. SMR licenses are based on regional coverage and contain from 5 to 20 channels. NexTel is the most aggressive company in this consolidation. SMR operators are purchasing properties and licenses in major cities and plan to offer nationwide ESMR capabilities that will look more like cellular than current SMR.

SMR and ESMR capabilities are found in procurements referred to by the government as Land Mobile Radio (LMR). Users of LMR include the Department of Defense for applications such as base radio support and combat deployable radio, the Department of Justice for law enforcement applications, and the Department of Agriculture in which many of their 29 agencies require mobile communication. As the federal government moves toward commercial services, the replacement of these systems will mean opportunities for mobile radio providers.

C

Two-Way Data Only

Commercial radio data services, such as provided by ARDIS and RAM Mobile Data, provide a capability to transmit data over a wireless network. Both ARDIS and RAM use a technology called packet radio, that broadcasts data in packets at transmission rates that range from 4.8K to 8K bytes per second and sometimes higher in certain locations.

1. ARDIS

ARDIS is a wireless two-way data network jointly owned by Motorola and IBM. First installed to provide IBM field representatives direct access to their databases and messaging systems, ARDIS is now the largest network for wireless two-way data connections, covering more than 400 U.S. cities and more than 40,000 users. An ARDIS subscriber anywhere within the coverage area can access the network.

ARDIS was designed as a company specific service. The bulk of the ARDIS users are connected to their corporate computers for specific tasks such as dispatch, sales, and repair order information. A connection from the user's computer is made to an ARDIS connection point. Mobile users can communicate only with those users who have the correct access software. In this way, a virtual private network can be built using ARDIS services.

2. RAM Mobile Data

RAM Mobile Data's system is currently the only competitor of ARDIS as a two-way data radio network. Functionally, the RAM system is similar to ARDIS, offering dispatch, data and messaging services. The primary difference in the two service providers is in the technology. While ARDIS uses a single 25MHz channel, RAM is based on a trunking technique with 10 to 30 12.5MHz channels per station. RAM was designed from the ground up as a nationwide service offering seamless roaming and large capacity.

3. Nationwide Wireless Network

The Nationwide Wireless Network (NWN) is planned as a two-way, data-only digital transmission system developed by Mtel Corp. as a derivative of its SkyPage paging network. NWN's coverage includes two-way messaging (including E–mail), acknowledgment paging on demand, broadcast services, database access, and similar services.

Mtel Corp. has been granted a "Pioneer's Preference" license from the FCC to develop NWN in the 930MHz bandwidth. A Pioneer's Preference license is awarded when a company demonstrates a distinctive and different technology that advances the state-of-the-art. NWN is unique in its transmitter/receiver pairing. Similar to SkyPage, NWN uses high powered transmitters for its outbound

signals. The innovation of the network appears in the receiver. Most systems pair a transmitter with a receiver at the same site. Mtel's transmitter covers several receivers stationed in a coverage area. This setup allows the system to use fewer transmitters with higher power for outbound and smaller low power transmitters in the hand-held device.

ARDIS, RAM and NWN can be competed on a functional basis by any wireless data-only service, including cellular or satellite paging services. That may explain why some agencies have indicated plans to consider two-way data two to five years out and only on a limited basis, if at all. Others see a great need in the future, but are holding out for more efficient technology. The consistent use of two-way is seen by agencies like the Federal Bureau of Investigation, U.S. Secret Service, National Security Agency, U.S. Postal Service, Department of Interior, Department of Veterans Affairs and U.S. Forest Service.

D

Cellular

Cellular systems are referred to simplistically as multiple, interconnected repeater sites. As a user of the cellular network travels across cell areas, moving in and out of range of a particular cell site, a "hand-off" occurs as the conversation in progress is passed to the next adjacent cell. A frequency re-use is in effect to manage the use of multiple cell sites and prohibit adjacent cell frequencies from interfering with each other.

Cellular systems provide predominately voice and some data capabilities through mobile and portable wireless devices. The conversion to digital technology is in its early stages and enables more data services to be offered.

1. Data Over Analog Cellular

Transmitting data over the analog cellular network uses circuit switched communications technology. Once a modem to modem connection is made, a circuit is dedicated to the communication while charges to the user accumulate on a per minute basis, even though the actual transmission of the data stream may be only a few seconds long. While the "hand-off" activity is not a problem for voice communications, which is very tolerant of dropped packets

or transmission delay, it often causes a modem to drop the connection due to loss of carrier. All aborted attempts still are charged to the user until the data are transmitted. The latest generation of cellular modems are more tolerant to carrier delay, noise and "hits" typical on a cellular call.

2. CDPD

The Cellular Digital Packet Data (CDPD) standard was developed by a consortium of eight cellular carriers to allow the use of the cellular infrastructure to send digitized packets of data. Data packets are sent over channels that are not in use for voice traffic, by either a dedicated channel or by frequency hopping. Frequency hopping uses a channel's idle time by interspersing the data traffic among and between the voice conversations and changing frequencies as needed on a non-interfering basis. CDPD also addresses security issues through a network interface device that encrypts data as part of the overall transmission process.

The CDPD consortium that developed specifications is made up of the following cellular operators:

- AmeriTech
- Bell Atlantic
- GTE/Contel
- McCaw Cellular (AT&T)
- NYNEX
- PacTel
- SWB Technologies
- U.S. West.

Companies that have fielded or announced CDPD compatible products include Motorola, Pacific Communications Sciences, Inc. and Sierra Wireless, Inc.

As more CDPD services become widely used, the use of cellular overall will continue to increase. Cellular users within the federal government will multiply with the General Service

Administration's Post FTS-2000 Program Strategy. Services under this strategy would satisfy all immediate federal cellular needs. This program has incorporated the Defense Information Systems Agency's (DISA) Wireless Telecommunications Service procurement which initially included DISA's Cellular Bulk Requirement.

E

Personal Communications Services

Personal Communications Services (PCS) has been given a very broad definition by the FCC as services and devices that address voice, data, image and video. The PCS-planned method of transmission is that of digital cellular services allowing people, wherever they are, to make calls or transfer data. PCS cell groups, however, cover a smaller range than those of cellular systems, requiring more cells to handle a given area. Therefore, PCS benefits from a lighter telephone handset requiring less power and a smaller battery to get to a cellular repeater site. PCS also enables a single, assigned telephone number to follow its user anywhere.

PCS is at least one year away from widespread availability. The PCS marketplace is a potential playing field for almost everyone, including the RBOCs, local exchange carriers like GTE, long distance companies, cable TV companies, competitive access providers (CAPs) as well as start-up organizations. Those involved in the PCS market claim that their services will be of a higher quality and a lower price than current cellular phone service. While the main thrust for PCS is as a competitor to the current cellular network, PCS actually has three major categories:

1. Broadband PCS

This is what comes to mind when PCS is discussed. Broadband is used as the integrated voice/data structure. A 120MHz band has been allocated in the 1859MHz to 1900MHz spectrum. (The current cellular phone system occupies only 50MHz.)

2. Narrowband PCS

Narrowband is used to provide pager-like services such as voice messaging or two-way paging in the 900MHz to 901MHz, 930MHz to 931MHz, and 940MHz to 941MHz bands.

3. Unlicensed PCS

Unlicensed PCS is a 40MHz block of the radio frequency spectrum reserved for short distance, unlicensed applications such as wireless LANs or PBXs.

PSC is a planned focus in the future for most of the federal government. Defense agencies, FAA, Justice, U.S. Secret Service, and U.S. Postal Service are most interested in and involved with this technology implementation. Many agency users have assigned PCS a lower priority than other wireless communications, or are waiting for more reliable products.

F

Wireless Local Area Networks

While they are not the replacement for wired LANs as was implied more than eight years ago, applications using either radio frequency (RF) or infrared (IR) transmission products have found their way into the overall LAN communications architecture. Both have significant advantages and disadvantages. Users can determine the appropriate type of wireless LAN transmission based on the distance to be spanned, the security and speed required, and the characteristics of the desired network location.

Few infrared frequency systems are designed to operate between buildings but rather within structures. Some signals of IR ranges pass only with a direct line-of-sight path in which direct, laser-like transmission of light is transferred from one device to another. Others diffuse light signals by bouncing them off walls, ceilings, and floors. The latter is more secure although its data signals will not travel as far. Users of wireless LANs find radio frequency systems generally more popular than IR because of their ability to allow data signals to pass through objects. Spread-spectrum RF broadcasts signals over a wide frequency band, allowing multiple users to operate simultaneously within a chosen spectrum.

Companies among those offering these services are listed in the Exhibit III-1.

Exhibit III-1

Companies Offering Wireless LAN Services

VENDOR	FREQUENCY	TECHNOLOGY
Fujitsu Personal Systems Inc.	IR	Tablet PC
Sun Microsystems Inc.	IR	Workstation
Pacemark Technologies	IR and RF	Peripheral sharing
Digital Equipment Corp.	RF	Bridge, adapter
Monicor Electronics Corp.	RF	Modems
Motorola Inc.	RF	Hub, bridge, transceiver
National Semiconductor Corp.	RF	Point-to-point modules
NCR Corp.	RF	Adapter
Proxim Inc.	RF	Bridge, adapter
Solectek Corp.	RF	Hub, bridge, adapter
Wi-LAN Inc.	RF	Transceiver
Windata Inc.	RF	Hub, transceiver

In general, LAN transmitters are not required to be licensed by the FCC. Such systems are considered to be local, operating strictly within the confines of a given installation. However, FCC license is required for narrowband RF because it employs a single frequency for data transmission. Major LAN applications include:

- Interconnecting buildings into a campus area network
- Supporting environments where PDAs or portable computers are used to access information or update inventories and records
- Providing connections where the wired installation is impractical or too costly.

Wireless bridges are gaining popularity and stability within the wireless LAN market. These bridges provide high-speed links between wired LANs of campus environments. They employ spread-spectrum RF and are capable of spanning a 3 to 25 mile distance. Although wireless bridges offer ease in installation and enhancement to overall flexibility of wireless communication, the downsides are price and lack of data security. However, many of the recent units include a Data Encryption Standard option.

RF and IR wireless LANs have become more reliable, with better performance over the past few years, and are increasingly specified in federal planning documents and procurements. The Federal Aviation Administration Logistics Center in Oklahoma City, the Army Signal Corps Battle Command Center, the Army Tactical Management Information Systems, the Federal Emergency Management Agency, and the Veterans Administration's ProMED are among the many federal activities using wireless LANs for various applications.

IV

Survey Findings

This section presents the results of INPUT's current survey of federal agencies as well as other agency information reflecting requirements and trends in the federal wireless technology market. Surveys were conducted primarily by telephone with 30 representatives from 26 government agencies. The participating agencies were targeted because of their interest in wireless technologies identified through research. However, not every agency sharing this interest is represented in the study. Respondents included Information Resources Management (IRM) executives, program managers, division chiefs, technology analysts and engineers. Interviews provide a perspective across the agency from policy makers to users.

Many of those interviewed are participants in the Federal Wireless Users Forum (FWUF). This Forum hosts workshops attended by government and vendor representatives through which user application requirements are identified and discussed. The FWUF operates under four main objectives:

- Educate federal government users about wireless communications
- Identify wireless telecommunications needs of federal government users
- Facilitate information exchange with other user groups, standards organizations, manufacturers, and services providers, to ensure that user wireless needs are met
- Support the interoperability of emerging wireless services and equipment through increased participation in the formation of federal policy, participation in wireless standards development, and other appropriate activities.

Some questionnaire respondents take part in the activities of the Federal Law Enforcement and Wireless Users Group (FLEWUG). This forum acts as a similar forum to the FWUF, addressing primarily the needs of the law enforcement community. The FLEWUG is made up of such agencies as the FBI and U.S. Marshals Service.

Overall, INPUT received favorable responses from agency representatives. Even before INPUT's objective of data collection was fully outlined, participants expressed willingness to provide an accurate status of wireless technologies in their agency. They were likewise, extremely interested in the results when they were compiled. Discussions supplemented the structured survey relative to the respondent's knowledge of wireless technologies and familiarity with applications. Agency comments reflected government's desire to work closely with vendors in identifying and applying wireless solutions. Key points are included in the analysis provided in this section.

The participating agencies in this study are listed in the federal agency respondent profile of Appendix A. The actual agency questionnaire can be found in Appendix F and its accompanying letter is presented in Appendix B.

A

Implementation of Wireless Technology

Based on the six major wireless technology categories selected for detailed investigation by INPUT, agencies were asked to indicate which of the products and services they currently are using or are planning to use by the year 2000. Exhibit IV-1 summarizes these responses.

Exhibit IV-1

Current and Planned Use of Federal Wireless Technology

PRODUCT OR SERVICE	PRESENT	NEXT 2 YRS	NEXT 5 YRS
Paging, Faxing, E–mail	29	24	26
Cellular	26	22	22
Personal Communication Services (PCS)	12	19	22
Specialized Mobile Radio (SMR)	13	16	19
Two-Way Data Only	13	16	19
Wireless Local Area Network (WLANs)	13	16	16

Number of Respondents=30

This table represents each wireless product and service category ranked by total number of interested agency users. The responses cover a span of five years, indicating breakdowns of agency use currently, over the next two years and over the next five years. The data represent the activities of 28 different, participating agencies, but should not be considered to represent the level of interest inclusive of all federal agencies.

Responses from this inquiry confirm that all areas of wireless technology provide a promising market for the future. The most popular wireless technology categories today are paging, faxing, E–mail and cellular, with virtually all respondents indicating present use.

Federal wireless product and service trends indicate a steady increase over the next five years. Although most popular now, paging, faxing, E–mail and cellular appear not so much to increase but to maintain their current level of use. Comments indicate that paging carries most of the weight in the first of the six categories. While some agencies are moving slowly because of security issues, paging is used widely within many, and is apparent in virtually all, of the twenty-eight agencies interviewed. Some agencies, however, are only in the early stages of developing an E–mail requirement or planning its use over the next few years. Wireless faxing is likewise not as popular as paging, while falling slightly behind E–mail capabilities as well. It was omitted from some responses or

labeled as very low in use. Faxing's use in law enforcement continues, but its efficiency and ability to survive in the market has been questioned.

Paging and cellular have acquired high numbers on the front end on the spectrum because of abundant availability, relatively low costs, and longevity of service. However, because of the lengthy procurement process, the data do not necessarily indicate actual use but could reflect intention to procure. In that case, the number of procurements that have been underway for cellular and paging are appropriately emphasized.

Key wireless environments within particular agencies are outlined below:

- The FBI is among the few agencies not planning to use cellular over the next five years. It has found alternative, more appropriate means of wireless communications because of security issues.
- Veterans Affairs, not currently using cellular, is planning for cellular requirements in the next two years.
- The Department of Agriculture is expanding cellular in its field sites, and this same "rural" environment sees a greater need for wireless paging, faxing and E–mail. While two-way data looks promising to USDA for the future, very little is being used currently because inherent low transmission speeds fall short of agency requirements. Finally, USDA has assigned a very low priority to PCS and has identified very little need for wireless LANs.
- Agencies that have expressed no interest in PCS include the Departments of Commerce and Energy. Others, like EPA, are conducting PCS pilot programs at selected sites, however, with little acceptance so far. NAVSEA is among the agencies that are ready for PSC, but are waiting for more functional products.
- Current users of WLANs include FEMA, U.S. Secret Service, U.S. Postal Service, Army CECOM, Navy, DISA, NSA and Departments of Energy, Justice, Interior and Veterans Affairs.
- EPA is included in the few agencies not planning for WLANs within the next five years. However, WLANs are planned for seven years from now.

- The National Security Agency, Department of Justice, U.S. Secret Service, and U.S. Postal Service have indicated a current and future use for all products and services discussed.

B

Obtaining Wireless Technologies

Agencies were asked how they plan to obtain (present and future) wireless products and services. Exhibit IV-2 indicates emphasis on particular means of doing so.

Exhibit IV-2

How Wireless Technologies Are Obtained

VEHICLE TO OBTAIN FEDERAL WIRELESS PRODUCTS AND SERVICES	PRESENT	FUTURE
Competitive Procurement	24	25
Directly from Vendor	14	11
Existing Service Contract	10	12
Other	0	0

Number of Respondents=30

This table represents the number of agency respondents who plan to obtain wireless technologies (present and future) through competitive procurements, directly from a vendor or through existing service contracts. No other vehicles were identified by the survey participants.

Competitive procurements are the most popular means by which agencies interviewed expect to obtain wireless products and services for now and in the future. This is consistent with requirements for full and open competition in the Federal Acquisition Regulations (FAR).

One half of the agencies interviewed indicated they would obtain technology directly from a vendor. These agencies may have requirements suitable for sole source contracts: urgency/emergency conditions for instant delivery; small purchases that fall under the competitive dollar value threshold; or a technology having only one source. Fewer agencies plan to obtain wireless technologies directly from a vendor in the future. This intention parallels quantity

increases that would raise the dollar value above the competitive threshold as wireless advances from a pilot stage to a requirements stage. Also, competitive alternative increases will decrease the chance for sole technology providers. Agencies should anticipate a future wireless market with more competitors and less single providers of products and services.

Currently product purchases are high which could explain why almost half of the respondents are currently obtaining wireless technologies directly from a vendor. The slight decrease in future purchases directly from a vendor is also representative that in the future agencies will be looking for complex solutions from integrators.

Agencies who operate with remote services or have employees in offices placed by territories or regions are likely to obtain wireless technologies directly from a vendor. These agency requirements are met with small quantity purchases for a select group of individuals rather than through large programs. Agencies that have indicated intentions to obtain wireless services and products directly from a vendor include:

- Agriculture
- Forest Service
- Commerce
- DISA
- Energy
- EPA
- FEMA
- Interior
- U.S. Secret Service
- NSA

Agencies operating under situations of emergency, safety assurance, or immediate response requirements are looking for existing service contracts. The amount of time involved with a lengthy procurement process can be crucial in such instances. Agencies looking for existing service contracts through which to obtain wireless technologies include:

- Energy
- FEMA
- Justice
- Interior
- NSA
- Navy
- U.S. Secret Service
- U.S. Postal Service

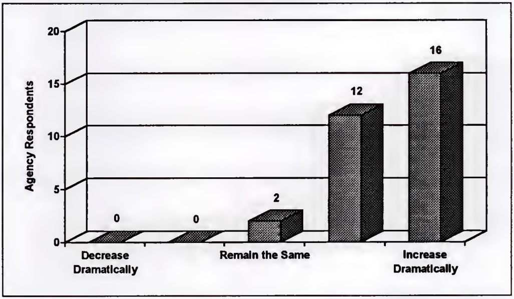
C

Agency Spending on Wireless Technology

Agencies were asked to identify their expected spending on wireless technology over the next five years. The responses were ranked from a dramatic spending decrease to dramatic increase, as shown in Exhibit IV-3.

Exhibit IV-3

Planned Federal Spending on Wireless



Number of Respondents=30

The graph above shows the total number of agency respondents by categories ranging from dramatic decreases to dramatic increases in planned wireless technology spending. Although funding, in general, for federal programs is declining, almost all of the respondents indicated spending increases for wireless technologies over the next five years. Operational uncertainties that prevail for agencies like the Departments of Interior, VA, and Commerce, whose programs are subject to 1996 appropriations bills still in dispute in Congress, do not seem to affect dedication to wireless technology implementation. Only two of the respondents expressed

a concern with spending levels and Congressional outcomes, although both felt safe in indicating that their wireless technology funding level would at least remain the same.

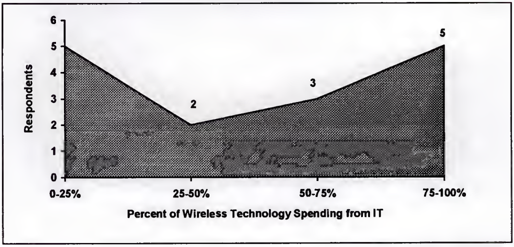
Agencies that have indicated a dramatic increase in wireless technology spending over the next five years include:

- USAID
- Agriculture
- Commerce
- Coast Guard
- FAA
- Energy
- GSA
- Interior
- National Park Service
- Navy & NAVSEA
- Treasury
- U.S. Secret Service
- U.S. Postal Service

Once the level of planned spending was established, respondents were asked what percent of their agency's funding for wireless technologies over the next five years would be part of IT versus non-IT spending. Exactly half of the respondents simply did not know from which source their funding for wireless would be disbursed and could not respond with a percentage breakdown. The results of the spending percentages indicated by fifteen respondents are presented in Exhibit IV-4.

Exhibit IV-4

Wireless Technology Spending (IT vs. non-IT)



Number of Respondents=15

The graph above shows the portion of wireless technology spending indicated by agency respondents to come from IT budgets over the next five years as opposed to the portion coming from non-IT funds. The total number of fifteen responses are distributed across twenty-five percent spending level increments. Fifteen of the participants who simply did not know their agency's funding breakdown are not included in the tabulation. Because the questionnaire encompasses a range of agency staff, from policy makers to users, it is understandable that some respondents focus on funding at their immediate program level and cannot accurately classify their agency's overall funding disbursements. Others are directly involved with analyses and technological developments apart from the actual spending decisions made when testing and evaluation are complete.

Even though an overwhelming sense of increase in spending for wireless technologies was expressed by the agencies interviewed, it is not clear what the funding source of that increase will be. The heavier end of the scale above falls to IT spending, and perhaps the fifteen respondents who do not know the funding breakdown may support this side as well. However, larger agency budgets still tend to differentiate between IT and wireless technology. In general, some portions of the products and services, for example WLANs and PBXs, are seen as IT, but others, like radio communication, fall into non-IT categories.

Although there is a slight inclination toward IT as the source of funding, one third of the responding agencies still have indicated technology funding to come primarily from non-IT spending over the next five years. This significant portion proves that vendors should not depend solely on IT budgets to track funding for wireless programs. There is certainly no consistent spending source across agencies. Finally, those agencies experiencing budget cuts in general actually may be rich potential wireless markets.

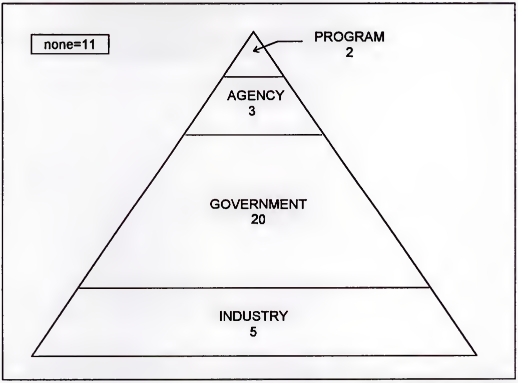
D

Agency Guidelines for Wireless Technology

Agencies were asked to indicate which guidelines they follow regarding wireless technologies. The responses were grouped into four categories according to scope as presented in Exhibit IV-5.

Exhibit IV-5

Scope of Directives and Guidelines



Number of Respondents=30

The pyramid shows the distribution of directives and guidelines identified by agency responses. The categories of directives and guidelines emphasize scope, with industry being the broadest and program the most specific. Agency choices were not mutually exclusive. Multiple sources were identified in some cases. Eleven of the 30 respondents indicated no source of guidelines for the federal wireless technology market. The remaining 19 identified the (30) overlapping sources shown in Exhibit IV-5.

When agencies consider standards, they have available several different sources. Industry-wide standards offer the broadest scope and reflect the greatest potential for assuring interoperability beyond immediate operating environments. Government-wide,

then agency-wide, then program specific move progressively toward more specialized applicability and away from requirements for interoperability.

Responses show that agencies view interoperability primarily at the government-wide level, with two thirds of the respondents identifying this as a source of directives and guidelines. With eleven of the respondents identifying no source for directives and guidelines, government-wide standards have greater prominence among federal wireless users. Very few respondents (2) identified specific program guidelines, either apart from or in addition to the other sources. Interoperability is clearly a requirement for wireless users.

The eleven responses of agencies having no directives or guidelines undoubtedly will allow the commercial marketplace to determine standard usage.

The scopes for directives and guidelines are described below:

1. Program Specific

Program level guidelines are developed internally on a case by case basis and, although specific, inevitably are impacted by guidelines of hierarchy.

2. Agency-wide

Agency-wide guidelines for wireless have been incorporated into existing documentation or are being developed as the need arises. The Forest Service, for example, rewrites a national strategic telecommunications plan every year. The plan now includes wireless activities.

3. Government–wide

Guidelines at the government-wide level include those from NTIA, the FAR, the Federal IRM Regulations (FIRMR), the Federal Wireless Policy Committee (FWPC), Executive Order #12958 as well as communications security (COMSEC) and operations security (OPSEC). Other government guidelines are found in manuals for radio frequency management and handbooks for telecommunications. Although government-wide implies national

policy, departments such as the EPA have additional policies defined by region and according to varying needs.

4. Industry

Industry-wide standards in wireless are most prevalent in agencies with overlapping services such as the Navy, other parts of Defense and the FAA. Industry standards at the international level touch upon activities of the Coast Guard.

5. External Influences

Among other sources influencing wireless guidelines is competition in the marketplace. As agencies continue to compare products competitively, ideal characteristics will shape guidelines. In fact, government has indicated a dependence on industry to establish guidelines, as such. The technical architecture of wireless will continue to identify standards simultaneously.

Despite extensive drafting in progress by agencies, very few guidelines are actually in place to address the wireless technology market. Even fewer are emerging. Some agencies have expressed concern with the lack of standardization and in many ways are relying on feedback from vendors. There are tremendous interest and support in wireless implementation by the federal community as seen through organized groups like the FWUF.

Agencies such as the Department of Agriculture are moving forward. USDA recently has established a sub-council specifically to address department-wide wireless guideline development. Veterans Affairs has developed plans for a Task Group structure as its central point for wireless data communications. The Task Group's objectives are to recommend policy and to attempt resolutions of relevant problems or issues. Among other activities, it would act as a single point of contact for vendors who wish to canvass VA or demonstrate their products and services. Now is the time for vendors to influence agency programs and to structure operating environments with interoperable solutions.

E

Factors Influencing the Use of Wireless Technologies

Agency respondents were asked to indicate what they believed to be the most significant benefits and liabilities to using wireless

technologies today. A wide range of responses was collected and is grouped accordingly in the following two exhibits.

1. Federal Wireless Technology Benefits

Respondents specified several major benefits to the use of wireless technology. A breakdown of the responses appears in Exhibit IV-6.

Exhibit IV-6

Benefits of Wireless Technology

BENEFITS	Number of Responses
Support Human Mobility	13
Functional Improvements:	30
Access	15
Performance	12
Deployability	3
Infrastructure Efficiency	12
Operational Benefits	16
Savings (cost and time)	9

Number of Respondents=30

From the thirty respondents, a variety of benefits for wireless technologies was collected. Mobility was a frequent response, implying that human beings simply must be able to move from one place to another freely while maintaining communication capabilities.

Functional improvement was the most frequent response. This category includes capabilities not available in the past or things we now can do better. “Access” makes up one half of the functional improvement benefits and is ranked just above performance. This category is defined as “access to communication capability.” It is very closely related to the first category of human mobility, and there may be an overlap in the interpretation of responses. Means of “access” actually may be the same technologies that support mobility as a benefit. However, the processes involved are

somewhat distinct. Mobility as a benefit implies a direct relationship with constant communications capabilities and travel. Access as a benefit focuses more on the availability of communications capabilities in a particular location. Finally, performance benefits are defined by human operational improvements as opposed to technical.

Operational benefits are related to the way in which we are able to do things. Falling into this category are the wireless technology characteristics of interoperability, ease of use, reliability and real-time function. Infrastructure efficiency includes ease in installation, for example, in setting up temporary emergency operations.

In general, agencies feel that wireless technologies will offer a great benefit to field agents, distant sites, and frequent travelers, providing mobile offices and efficient exchange of information with anyone, anywhere and at anytime. Increased employee productivity and better service definitely have been highlighted as underlying priorities.

Although cost and time savings received the lowest ratings, they can be direct results of almost all of the other categories listed above. However, agencies did not indicate savings by relating cost only to the purchase and maintenance of wireless products and services. Cost appears as a concern in the following section outlining liabilities.

2. Federal Wireless Technology Liabilities

What are the liabilities agencies see when considering wireless technology implementation? A breakdown of the responses is demonstrated in Exhibit IV-7.

Exhibit IV-7

Liabilities of Wireless Technology

LIABILITIES	Number of Respondents
Product Quality	25
Cost	22
Security	17
Employee Training	5
Other	11

Number of Respondents=30

Although product quality is ranked highest from an agency perspective among liabilities in using wireless technology, the issue of cost is almost as highly ranked. The actual cost for wireless products and services is not the only agency concern involved with this issue. Agency respondents also expressed concern in developmental and technology transfer costs as well as continuing contract costs built into what appears to be an initial, defined requirement. Among the product quality liabilities shared by agencies were data rate, battery life, reliability, limited range, interoperability, and bandwidth capacity.

Responses about the security liability of wireless technologies were not expanded upon. However, military personnel cited physical location recognition from obscure antennas as a liability of their wireless technology use. Defense respondents also were concerned about the government losing their frequency spectrum as the wireless market expands.

The liability of employee training, which also can fall under the cost issue, means not only educating users of the new technology, but also educating program managers on spending allocations in this market. Agencies are aware of this need and are prepared to invest a fair amount of time and money into education and training. In general, agencies are just as interested in ensuring proper and efficient wireless use among employees as they are in implementing technological advancements.

Other responses included variations within the areas listed below:

- Lack of standards (in government and industry)
- Lack of proper cellular cites and infrastructure
- Lack of technology choices and competition
- Gradual increase in agency dependency on the private sector.

Many of the wireless technology liabilities expressed by agencies appear again in the following chapter on vendor trends and issues. Vendor responses on product value improvement (Exhibit V-5) were grouped in similar terms. Agency and vendor comparison analysis is offered in Chapter V where appropriate.

V

Vendor Trends and Issues

This section moves into focus the vendor perspectives of the federal wireless technology market. Surveys were conducted with fifteen vendors across each of the six wireless product and service categories defined by INPUT. Vendors were selected according to their dedication to the wireless market and on the availability of marketing and product information. Survey respondents included company executives and high-ranking marketing personnel.

INPUT received favorable responses from vendors during the data collection process. The respondents share many of the concerns for suggested product and service improvements indicated by federal agency representatives. The few vendor participants who currently are not pursuing business with the federal government are interested in learning more about its market through the results of this report and other sources. A list of the companies interviewed is provided in Appendix D.

A

Vendor Performance

Based on the six wireless technology categories, vendors selected for the survey were asked to indicate the wireless products and services they currently provide or plan to provide by the year 2000. Results are stated in Exhibit V-1.

Exhibit V-1

Wireless Technologies Provided by Vendor

PRODUCT OR SERVICE	CURRENT	PLANNED
Paging, Faxing, E-mail	8	4
Wireless Local Area Network (WLANs)	8	4
Two-Way Data Only	7	3
Personal Communication Services (PCS)	7	3
Cellular	5	3
Specialized Mobile Radio (SMR)	3	2

Number of Responding Vendors=15

Current development and investment in products and services by the vendor sample are summarized in Exhibit V-1. This table represents each wireless product and service category ranked by total number of vendor providers. The responses of the 15 participating vendors cover a span of five years, indicating current or future plans to provide wireless technologies across all technology categories. The responses do not reflect an interest by all vendors across all market segments.

While companies continue to improve and advance product lines, competitors will likewise continue to enter the market in the years to come. Vendors such as Airlink Communications have a technology focus only on cellular products both currently and in the next five years. Others are widely expanding their development of products and services across multiple segments. Computer Sciences Corporation, for example, provides wireless E–mail capabilities, but plans for the future include expansion into SMR, Cellular, PCS and WLANs.

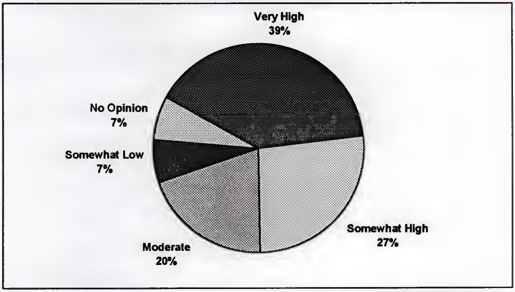
Company planning aside, when a demand either is made known or is discovered, industry responds with a solution and competition follows. In the federal marketplace, agencies are waiting for vendors to demonstrate application value and to help identify their requirements. Now is the time for vendors to step forward with their products and services and become visible in federal agencies before identities are diluted by competition.

B
Growth Potential of Federal Wireless Market

Vendors were asked to indicate their perspectives of the growth potential in the federal wireless technology market over the next five years. Exhibit V-2 shows respondent growth potential ratings.

Exhibit V-2

Vendor Perspective of Market Growth Potential



Number of Responding Vendors=15

The graph groups vendors according to their rating of growth potential of the federal wireless market. The portion of vendors not familiar with the federal marketplace is expressed as 7% for no opinion.

Thirty-nine percent of responding vendors qualified federal wireless technology with the highest possible growth potential. This is slightly lower than the 53% (Exhibit IV-3, page IV-7) of agency respondents who indicated dramatic increases in federal wireless spending within the same time period. Thus, in comparison to agency planned spending, vendors are slightly less optimistic of the federal market potential for wireless technology. It is significant that 86% of responding vendors believed there would be at least a moderate growth in the federal wireless market.

C

Factors Affecting Growth

Vendors were asked, "What are the top key factors that would contribute to the growth or non-growth of the federal wireless technology market?" Their responses were grouped in the five major categories listed in Exhibit V-3.

Exhibit V-3

Key Factors Affecting the Federal Wireless Market

FACTORS	Number of Responses
Market Characteristics	10
Security	8
Product Quality	8
Cost	7
Standards	5

Number of Responding Vendors=15

The table lists key factors, ranked by number of vendor responses, that contribute to the growth or non-growth of the federal wireless technology market. Vendors were encouraged to provide up to three factors. A total of 38 were recorded. While categories of security, cost and standards were not elaborated upon, vendors provided many variations of product quality and market characteristics.

Market characteristics were ranked highest in influencing wireless technology growth within the federal government. Vendors believe that, in general, wireless market growth will depend on need and acceptance, whether in local government activities or extended globally (especially in military communication). Federal spending allocated for wireless certainly is believed by vendors to impact growth. As the market evolves, availability of site locals as well as availability of adequate frequencies and wavelength will also influence growth.

According to responding vendors, the product quality factors affecting wireless market growth include standardization, interoperability, data compression, developments of applications, delivery of entire applications, and the ability to integrate with existing infrastructure.

Product quality, along with issues of security and cost, will be reflected in market characteristics important in projecting the need for wireless technology and its acceptance into the marketplace.

D

Agencies Providing the Most Attractive Opportunities

Vendors were asked to identify agencies offering the most attractive wireless technology opportunities. The results fell into three categories, as shown in Exhibit V-4.

Exhibit V-4

Where Are the Most Attractive Opportunities?

OPPORTUNITY AREAS	Number of Responses
Military/Defense	11
Law Enforcement	8
Other	5

Number of Responding Vendors=15

Federal wireless vendors see the opportunities to be in relatively few operating environments: military and law enforcement. The five other responses identified five specific agencies:

- DLA
- GSA
- Justice
- NSF
- Treasury.

DoD's early adoption of wireless technologies is the reason for its high response rating. The impact of Defense operations on the future of wireless is certainly significant. This was first seen when vendors indicated military communication as a characteristic of the wireless market.

Law enforcement is another strong area of interest and is associated with high numbers of people in the field in need of fast and efficient communication capability. Aside from the eight vendors indicating law enforcement in general, specific references were made to the FBI,

IRS and U.S. Customs Service. The FBI's current developmental efforts for a Law Enforcement Wireless Communications Network initiated by a directive of the National Performance Review may contribute to vendor interest.

The campus-like environment at the National Science Foundation (NSF) is ideal for wireless technology implementation, but many agencies have similar environments. It is surprising that few agencies were identified, especially those agencies that have expressed definite needs for wireless. GSA identified its current Post FTS-2000 procurement, in which the central agency acts as the contracting agent for wireless communications purchases for the entire federal government. Other agency opportunities are less known because they have no established commitment to large purchase contracts occurring anytime soon.

E

Competitive Advantages in the Federal Market

Agencies were asked to indicate the top three advantages of competing in the federal wireless technology market. A wide range of advantages was reported:

- High volume purchases
- Federal market is open/untapped
- Increased need for technology because of downsizing
- Expected increases in federal funding for wireless
- Opportunity to expand business into other agencies once established
- Opportunity to capture long-term commitment
- Revenue
- Recognition of products
- Enhanced market from federal approval on products.

Revenue, high volume purchasing and recognition of products are advantages characteristically found through large wireless contracts. But for now, few agencies aside, vendors are competing primarily for small purchases in support of pilot programs or selected staff use. This trend explains why so few agencies were indicated to have attractive wireless opportunities. The programs simply are not large

enough and opportunities for the future are not yet tangible. As the market matures, procurements surface and the volume of requirements expands, more agencies will be recognized as wireless markets with competitive advantage environments.

F

Product and Service Value

Vendors were asked what they could do to make their wireless products and services more valuable to the federal government. Responses fell into five main categories as shown in Exhibit V-5. Overall, vendors were extremely supportive of product quality improvement.

Exhibit V-5

How Vendors Can Increase Product and Service Value

VALUE IMPROVEMENTS	Number of Responses
Increase Product Quality	11
Lower Costs	4
Resolve Security Issues	4
Help Set Standards	3
Cooperative Development	3

Number of Responding Vendors=15

Responses on lowering costs and resolving security issues were stated in general terms. Product quality improvements were stated more specifically: increased transmission capacity, assurance of interoperability, integration with present technology, and reliability in performance. As part of cooperative development, vendors suggested that they should dedicate themselves to pushing technology and demonstrating its benefits to the federal community. Respondents also emphasized a need for communication among and between vendors.

Cost, security, and product quality were exactly the same issues ranked among the top agency liabilities in using wireless technologies (See Exhibit IV-7). Lack of developing standards, an activity in which three vendors felt they should be a part, was also identified as an agency liability.

It appears that agency and vendor representatives share similar concerns and have identified the same areas of improvement for products and services. With increased cooperative development between and among users and providers, the domino effect will convert many of the wireless liabilities to benefits, expand federal wireless requirements, and increase revenues for participating vendors.

G

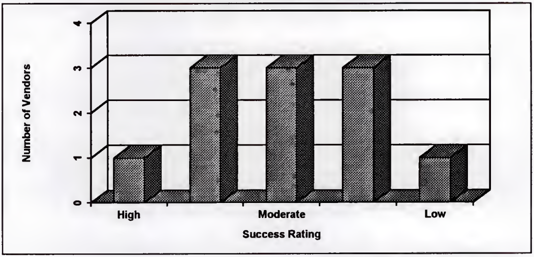
Teaming Patterns

1. Teaming Efforts

Vendors were asked to rank their level of success in establishing a competitive position in the federal wireless market through teaming efforts. Exhibit V-6 displays the number of vendors by their indicated success of teaming efforts in the wireless market.

Exhibit V-6

Success Through Teaming Efforts



Number of Responding Vendors=11

Four of the 15 vendors have not yet participated in teaming arrangements and, therefore, are not represented in the graph. The responses are centered around moderate teaming efforts. The indicated success rate is somewhat low for this market.

Teaming efforts in the federal marketplace, in general, are becoming more frequent in order to respond adequately to the terms and conditions of many agency requirements. A more established market such as computer security, with more than half of the participating

vendors reporting highly successful teaming relationships, shows one of many contrasts to a premature market such as wireless. The moderate success rating could result from the fact that there have been very few teaming efforts. Vendors have not been able to identify and build the relationships that define success.

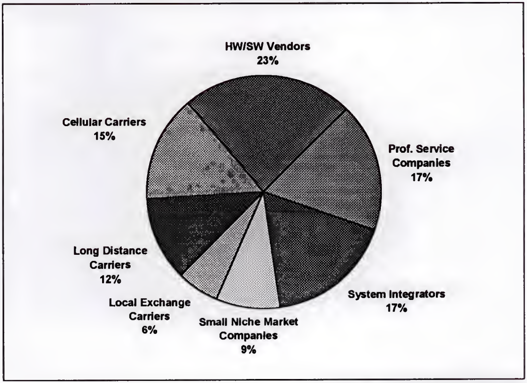
This is not very good news for agencies that benefit from strong teaming contracts. However, when the bulk of agency wireless requirements materialize, an enhanced teaming environment will have developed through increased vendor competition and experience. The current focus for wireless vendors is on actual market definition. A later focus will be on teaming efforts.

2. Teaming Partners

Vendors were asked to identify their most frequent or preferred type of teaming partner. The percentage breakdowns are found in Exhibit V-7.

Exhibit V-7

Frequency of Teaming Partnerships



Number of Responding Vendors=15

Twenty-three percent of the interviewed vendors ranked hardware and software companies as the single most frequent teaming partner in the wireless market. This frequency implies federal wireless requirements in terms of a commodity market. The 9% vendor response rate allotted to small niche market companies indicates a fair presence of sole source products currently on the market. These specific products have not yet been challenged by competition and have therefore not experienced price reductions. Teaming arrangements may continue to call upon the specialized expertise limited to these niche companies, as wireless requirements continue to be implemented and until competition evolves.

The 33% of preferred teaming partnerships dedicated to cellular, long distance and local exchange carriers is an indication of the degree of market dependency on communications infrastructure. Approximately one third of preferred teaming partnerships reported for professional service companies and systems integrators combined, represents yet another significant dependence. This 34% response rate emphasizes the requirement of human performance and interface to integrate wireless technology effectively within operating environments.

VI

Market Analysis and Forecast

This chapter discusses projected spending growth in the federal wireless technology market. Spending covers the government fiscal period from 1995 to 2000. By understanding the size of this market and its anticipated growth, a vendor can assess its business potential.

The baseline numbers for the forecasts in this chapter are derived from the standard A-11 reports provided by each agency annually to the Office of Management and Budget. While these reports do not feed the President's budget directly, they are intended to outline anticipated expenditures for information technology products and services in support of government programs.

A small proportion of IT spending is not reported during the A-11 process because amounts fall under reporting requirement thresholds. This level of spending has been estimated for the purposes of the forecast. Other spending might not be reported because it is not considered to involve information technology in specific terms. For example, wireless communications may not involve costs for computers or leased telephone lines.

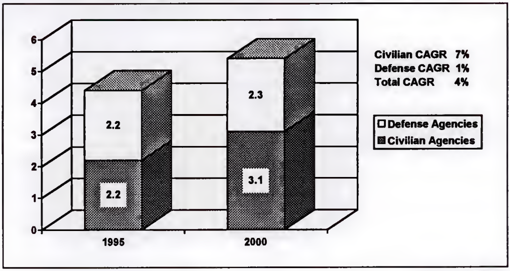
A

Communications Market Forecast

Wireless communication is part of the larger category of communications. Because agencies do not specify exactly what their communications dollars will be spent on, it is necessary to look to this larger class to establish an outside boundary. Exhibit VI-1 shows the overall federal government communications forecast. Segments of this market are shown for civilian and defense agencies.

Exhibit VI-1

Overall Federal Government Communications Market



Figures in $ billion

Although the sizes of civilian and defense organization spending for communications are approximately equal in GFY1995, by GFY2000 civilian spending will increase such that it will attain almost 60% of the total federal government communications market. With the overall growth rate of the federal communications market slightly outpaced by the IT market (5-year CAGR) overall, competition for available spending can be considered a more significant problem than in recent past.

Many agencies will spend program dollars other than dollars reported under A-11. This spending will include small purchases.

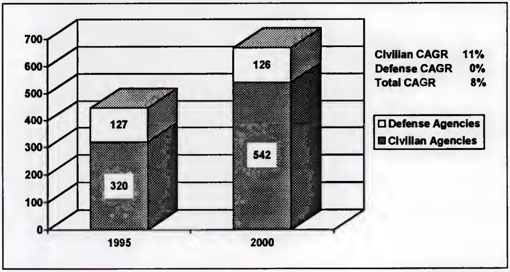
The defense spending portion of the overall communications market is actually declining, at a 1% CAGR, in real dollars. Civilian agency spending growth at 7% clearly indicates that most new opportunities will come from non-defense programs. For a more complete discussion of the communications market, please refer to INPUT's report, *Federal Information Systems & Services Market, 1995-2000.*

In order to understand spending levels in the communications market that address wireless technologies and services, the overall communications market has been subdivided into relevant segments: hardware, professional services, and network services. (The largest communications segment, leased circuits, is not

included.) Exhibit VI-2 shows the communication hardware submarket, broken out by defense and civilian spending.

Exhibit VI-2

Federal Government Communications Hardware Submarket



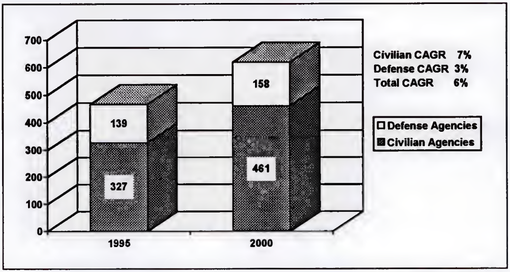
Figures in $ million

The hardware products segment of the communications market represents the largest growth area. Although growth will not occur in the overall defense organization, civilian growth shows a very healthy 11% growth rate. The substantial portion of this growth will be for commercial off-the-shelf-products.

Exhibit VI-3 shows the professional services submarket. Here the growth is not as great as for products, but at least in the civilian agencies, significant growth can be expected. Services include network design, installation, training, and maintenance. Whatever growth occurs in the defense communications market will occur in the professional services segment.

Exhibit VI-3

Federal Government Communications Professional Services Submarket

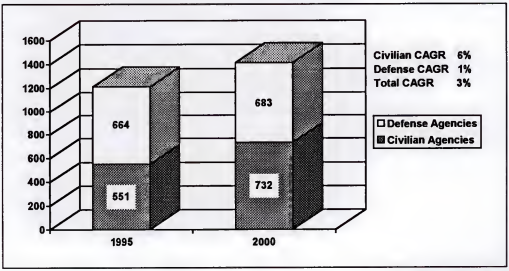


Figures in $ million

Network services is the third segment of the communications market that would include wireless spending. Based on reported budget levels, this submarket represents the largest area for contractor support. Transitional spending from defense to civilian agencies is also more obvious in this submarket. Defense spending shows a shift from 55% in GFY1995 to 49% in GFY2000. The spending levels for the network services submarket are shown in Exhibit VI-4.

Exhibit VI-4

Federal Government Communications Network Services Submarket



Figures in $ million

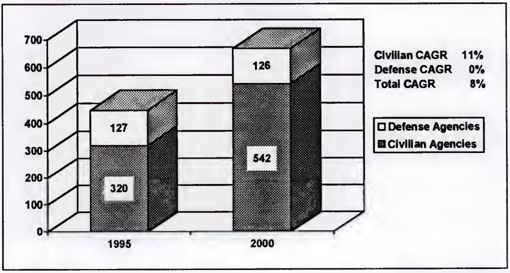
B
Wireless Market Forecast

The wireless market in the federal government is an understated segment of information technology budgeting. One reason wireless is still relatively small in this market is that there are few commercial products available for agency network planners. The second reason is that agencies are, in general, unaware of many functionalities available through wireless products and services.

The problem of awareness results from agency focus on program spending reduction and not on new capabilities and functionality. Industry must accept the responsibility for educating potential users on functionality and also must assure that stated problems in using the technology are overcome. Spending for wireless will increase as implementation demonstrates either reduced operating expenses or improved service. It is not likely in today's environment that the government will be interested in doing something it is not already doing.

Exhibit VI-5

Federal Government Communications Product and Service Submarket



Figures in $ million

Exhibit VI-5 shows anticipated growth of the communications submarket that contains wireless. The wireless submarket is expected to grow from $55 million in GFY1995 to $65 million in GFY2000, at a CAGR of 3%. This apparent slow growth compared to the 8% CAGR for the submarket is due largely to agency

uncertainty of existing wireless products and not due to limited potential of future products. Industry has the responsibility for assuring acceptable products and convincing agency planners to commit communication dollars to commit communication dollars to wireless solutions. This growth follows the growth rate of the overall communications market (See Exhibit VI-1). Growth rates may improve slightly, but only as new products can demonstrate in the commercial markets how security and dependability problems have been solved.

C

Summary

The federal government communications market has experienced major growth over the past five years, in spite of downturns in overall program spending. The market will continue its growth, but at a lower rate due primarily to the plans by the Administration and the Congress to balance the budget and reduce the federal deficit. These plans translate into lower agency spending in other budget categories.

The requirements of government agencies will not be reduced concomitant with budget reduction. Improved communications is seen as an enabler to better performance, and for more efficient operations.

Communications requirements are deeply inherent in most program execution. Many communications approaches have forced operational compromises on the mobile community. These compromises may be removed if wireless technologies can demonstrate satisfactory, secure performance and reliability.

The federal government is also deeply committed to commercial product purchasing. The preference for commercial products implies that products first must be proven in the private sector. Many government applications are found in the private sector as well. Others, such as defense and national law enforcement, are unique to the federal government and require unique solutions. Wireless services will have to be robust for these tactical environments.

Most new wireless opportunities will be found in civilian agencies. This does not mean that defense requirements will disappear.

Significant spending will continue in military operations, but increased spending will not occur until a major military encounter occurs, such as in response to escalation in the eastern Europe arena. In that event, the Congress is more likely to establish emergency spending levels.

Civilian opportunities will follow the commercial uses for wireless technologies. Law enforcement, environmental services, and other field related programs will lead this market growth. Security concerns are major limiting factors, but product robustness also will influence growth rates.

No attempt has been made to subdivide the market forecast by the six wireless segments. Cellular use has been the most popular use of wireless, but integration with local area networks has great appeal for government program planners. Other segments will grow more slowly as products and services prove themselves both functionally and reliably.

(Blank)

VII

Conclusions and Recommendations

Vendors interested in the developments of the wireless technology market should begin by tracking the overall telecommunications industry. Complete communications (voice, data, or video) anytime to anywhere is the vision of the telecommunications market brought about by the continued merger of the communications and computing industries. Much of the enabling technology to achieve this vision is based on emerging technologies in wireless communications.

Wireless products and services will be subject to strong implications from telecom providers. The major players are penetrating all areas of wireless competition, and their goals and objectives will help to define accurately the future of the wireless technology market.

The federal government has expressed a strong interest in wireless technologies for now and in the future, across both defense and civilian agencies. It is inevitable that defense activities, encompassing an enormous employee base, will have a strong impact on the direction and success of this market. DoD is consistently involved with initial testing of technology, including wireless, and is in highest demand for product quality issues such as security.

While vendors see significant spending continue in military operation, they should watch for most new wireless opportunities in civilian agencies. These opportunities, following commercial uses of wireless technologies, are found in individually defined markets within agencies.

Unlike more defined markets, diversity across and within operating environments in terms of wireless is great. Within defense alone each military service has a different perspective about which technology application is most useful for its needs. Federal wireless users not only must choose appropriate applications but must make a value judgment on the transmission medium which will best meet their objectives.

The expertise of vendors offering and developing wireless products is valuable. In many ways, agencies are collectively relying on vendors to provide an understanding and awareness of available technology and modifications planned for the future. Agencies need individual guidance in identifying their requirements and even in defining them thorough RFP specifications.

Vendors should dedicate efforts to push technology and demonstrate its benefits to the federal community. The added benefit of valuable input from agency users can advance vendor developments in areas of product quality, security and cost. These important issues have been identified by both agencies and vendors as key factors in the growth of the federal wireless market.

Aside from various product quality improvements identified in this report, consolidation of services is becoming significant to wireless users. Vendors should watch the competition closely among companies that sell single mobile devices that integrate voice, data and paging. As competition increases and products evolve, wireless users will require consolidation of services.

A

Influence Standards and Directives

Government-wide standards have greater prominence among federal wireless users for now, but agency-wide and program level standards, as they are established, will be more significant to technology and competition. The good news for vendors is that few standards at the agency and program level are yet in place.

Vendors can influence and structure an environment for their products and services by participating in events like the Federal Wireless Users Forum (FWUF). The FWUF is collectively the most valuable event in place for information exchange on wireless technology use. Through these meetings, vendors have the

opportunity to offer solutions through their product capabilities. Product demonstrations should be scheduled with certain agencies when potential environments are identified.

Capability demonstrations can be accomplished by identifying special wireless groups that are forming within individual agencies of interest. The VA, for example, has planned for its Wireless Data Communications Task Group, among other activities, to act as a single point of contact for vendors who wish to canvass its organization or demonstrate products and services. Many other agencies have formed internal committees of this nature that are assigned to wireless strategy and oversight.

B

Influence Specifications

Federal opportunities for many of the products and services described in this report depend to a certain extent on how well the procuring agency states specifications that describe functionality rather than specific technologies. Technologies such as SMR, ESMR, and private radio networks, such as ARDIS or RAM, are capable of providing virtually all of the services declared as being available only with cellular, CDPD, or PCS technologies. Functional specifications allow each vendor to compete with variations in technology to provide the best service to an agency.

For years, vendors have been influencing successfully the specifications of request for proposal documents. Agencies are relying in many ways on feedback from vendors. Wireless requirements only now are being defined while many pilot programs are in progress. Therefore, vendors should take advantage of the opportunity to communicate with agencies and help shape the specifications as they are defined. This process may be less difficult than attempts to modify specifications after they have been stated.

C

Summary

Now is the time for vendors to step forward with their products and services; that is, as standards still are being defined and while the opportunity exists to become visible in federal agencies before identities are diluted by competition.

Government in general views wireless technology as a sound investment, but agencies are asking themselves what the most efficient means of communication is while keeping costs down. While products continually are becoming more sophisticated and support more applications in a single device, users must remain aware of the competing standards and transmission media that could render a purchase choice obsolete.

The first step is to identify what agencies want. Then, effective standards followed by price reductions can fall into place. The best way to define agency needs is through cooperative development efforts and technology experimentation in the federal marketplace.

A

Federal Agency Respondent Profile

Interviews for this study were conducted primarily by telephone and a few by facsimile. The respondents interviewed include federal IRM executives, contracting and program managers and engineers. A wide range of civilian and defense agencies are represented in this study:

Agriculture

  Forest Service

Commerce

  National Telecommunications Information Agency

Department of Defense

  The Joint Staff

  Department of the Army

  Department of the Navy

  Defense Information Systems Agency

  National Security Agency

Department of Energy

Environmental Protection Agency

Federal Emergency Management Agency

General Services Administration

Department of Interior
  National Park Service
Department of Justice
  Federal Bureau of Investigation
NASA
U.S. Postal Service
Department of Transportation
  U.S. Coast Guard
  Federal Aviation Administration
Department of Treasury
  U.S. Secret Service
U.S. Agency for International Development
Department of Veterans Affairs

B

Letter to Agencies Interviewed

November 17, 1995

Dear Agency Official:

INPUT is conducting a survey to determine the level of interest in wireless technologies by federal government officials. The results of this survey will help vendors to understand agency requirements and to better position themselves in recommending appropriate solutions for federal wireless implementation. We would like to include your organization's activities in our survey, and in return, provide you with the Executive Summary of our report. Your organization's participation is important in developing a comprehensive analysis of wireless technologies in the federal government.

We will be contacting you in the next few days to confirm your interest in our survey and to collect the necessary information. To acquaint you with the information desired, attached is the research questionnaire which we will complete during the telephone interview. This interview should take no more than fifteen minutes of your time. Although our experience is that the dialog of an interactive interview significantly enhances the quality of information gathered, we recognize your time constraints. If you prefer, a completed questionnaire faxed back to us would be greatly appreciated as well.

We hope to complete the research for this report in the next few weeks and would appreciate your response as soon as possible. All information obtained by this survey is confidential. Only a summary and analysis of the information is represented in our report. Responding agencies will be identified, but officials will not.

Feedback from you and your peers on our reports and information sharing has been very positive. Please inform me of any ideas and

suggestions you may have about how our understanding of technology needs, issues or direction of the federal user community could be of use to you. Thank you for your time and cooperation with our data collection process.

Sincerely,

Scott W. Lewis

Vice President

INPUT

C

Vendor Profiles

Following are profiles of major wireless technology vendors from each of the six wireless product and service categories defined by INPUT. These vendors were selected according to their significance in the market and the availability of product and marketing literature.

A
Paging, Faxing and E–mail

Motorola Paging Products Group

1500 Gateway Boulevard
Mail Stop 64
Boynton Beach, FL 33426-8292

POC: Customer Service
(800) 548-9954

This branch of Motorola's Messaging, Information and Media Sector is one of the largest suppliers of paging products to paging service companies around the world. The paging product line includes numeric display devices, alphanumeric display devices, two-way paging devices, voice devices, wireless data receivers and a wide variety of related products.

Paging Network, Inc.

4965 Preston Park Blvd. #600
Plano, Texas 75093

POC: Corporate Office
(214) 985-4100

Paging Network, Inc., better known as PageNet, offers numeric and alphanumeric paging, news and stock updates, voicemail, fax forwarding and wireless data transmission to palmtop and laptop computers and Personal Digital Assistants (PDAs). In September 1995, PageNet surpassed Japan's Nippon Telegraph and Telephone to become the largest wireless messaging company in the world. PageNet plans to enter the two-way paging market in 1996.

B

Specialized Mobile Radio

Nextel Communications

201 Route 17
North Rutherford, NJ 07070

POC: Walter Piecyk
Public Relations
(201) 531-5677

In 1994, Nextel Communications signed agreements for the purchase of all of Motorola's United States Specialized Mobile Radio licenses and businesses and for mergers with Questar Telecom, Inc., Advanced Mobilcom West, Inc., OneComm Corporation and Dial Page, Inc. Nextel is pursuing strategic alliances to enable mobile digital communications service across North America.

Dataradio Inc.

5500 Royalmount Avenue
Suite 200
Mount Royal, Quebec, Canada H4P 1H7

POC: Steve Kabbas
Sales Coordinator
(514) 737-0020

Dataradio has been developing data-by-radio solutions in fixed and mobile environments for fourteen years. Dataradio's COR (Connectivity Over Radio) products range from basic telemetry radios to a full line of intelligent radio modems.

C

Two-Way Data Only

SkyTel Corporation

1350 I Street, NW
Washington, DC 20005

POC: Service and Product Information
(800) 643-0323

Skytel announced the first commercial two-way paging system in September 1995. Two-way paging service is aimed at blending the strength of cellular phone communications, responsiveness, with the strength of one-way paging services, the accessibility of the receiver. The system will be marketed by MCI and is available in more than 1,300 cities. Skytel is forming marketing and developmental alliances with Hewlett-Packard, Microsoft and Motorola to pursue the incorporation of two-way paging technology into mobile computing and data access devices.

Geotek Communications, Inc.

20 Craig Road
Montvale, NJ 07645

POC: Randy J. Miller
Senior Director, Corporate Communications
(201) 930-9305

Geotek Communications, Inc. has designed a digital network called GeoNet to support two-way mobile data communications. GeoNet two-way mobile data services will provide switched circuit data services, such as faxing, and packet data services including data broadcast, two-way messaging, and E–mail with optional acknowledgment.

D
Cellular

Apex Data, Inc.

6624 Owens Drive
Pleasanton, CA 94588

POC: James L. Keitchen
Director of Marketing
(510)-416-5656

Apex Data, Inc. is the first Personal Computer Memory Cards International Association (PCMCIA) supplier to offer a 28,800 bps cellular data/fax modem. Apex Data entered the wireless connectivity market in 1994 with its Mobile Plus Cellular products and, utilizing a strategic alliance with Celeritas Technologies, has incorporated error avoidance technology to ensure rapid, reliable data throughput.

Pacific Communication Sciences, Inc.

9645 Scranton Road
San Diego, CA 92121

POC: Dan Holmes
Manager, Business Development
(516) 385-1582

PCSI is a pioneer in the Cellular Digital Packet Data (CDPD) technology and participated in the first field trials of CDPD by carriers. PCSI offers products including the Ubiquity cellular communications systems, Cellerity mobile database stations, and Clarity integrated access multiplexers. These products help customers integrate voice and data communications among distributed sites.

Rockwell Telecommunications

Digital Communications Division
4311 Jamboree Road
P.O. Box C
Newport Beach, CA 92658-8902

POC: Telecommunications Headquarters
(714) 833-4600

Rockwell plans to establish a leadership position in digital wireless communication components to facilitate radio transmission of digital information by leveraging digital signal processing, IC, process design and development and communications protocol/algorithm competencies. Initial product offerings include a wireless data modem device set that integrates Mobitex packet radio technology and a cellular digital packet data (CDPD) modem device that builds on the strengths of existing cellular phone services.

E
Personal Communications Services

California Microwave, Inc.

985 Almanor Avenue
Sunnyvale, CA 94086

POC: (408) 732-4000

California Microwave is a significant supplier of Personal Communications Service digital microwave radios. With more than 25 years of experience in radio technology, California Microwave has developed a customer base including government and private telecommunications agencies, multinational corporations, broadcasting companies, power and water utilities, major stock markets, and electronics manufacturers.

Northern Telecom Wireless Networks

2221 Lakeside Boulevard
Richardson, TX 75082

POC: Sales and Marketing Information
(800) 466-7835

NORTEL offers wireless service operators the strength and experience of an established global network provider, leading-edge digital radio and switching technology, rapid network and service deployment, and one of the industry's most comprehensive portfolio of turnkey network solutions. The NORTEL PCS product line includes the NORTEL PCS 1900 system, a comprehensive wireless network portfolios of digital solutions for your radio, switching, handset, and advanced antenna product requirements. Intelligent networking functions are incorporated throughout the system. Also available is the NORTEL

Code Division Multiple Access (CDMA) network that can flexibly support applications for cellular 800 MHz and Personal Communications Services (PCS) 1900 MHz applications, and the Omnipoint radio technology, which is designed to operate on a stand-alone basis in either 30 MHz or 10 MHz.

F

Wireless Local Area Networks

Cabletron Systems, Inc.

35 Industrial Way
P.O. Box 5005
Rochester, NH 03867-0505

POC: Russ Lefchak
Account Manager, Business Development
(703) 620-2800

Cabletron is a vendor of wide and local area network hubs. Cabletron's product philosophy calls for the ability to migrate to future technologies without sacrificing the investments customers have made in existing equipment.

Extended Systems, Inc.

5777 North Meeker Avenue
Boise, Idaho 83713

POC: Customer Service
(800) 235-7576

Extended Systems, Inc. has a variety of infrared connectivity and data transfer devices in its JetEye product line. Extended Systems' primary business focus is on printer sharing, network print servers and fax solutions.

Solectek Corporation

6370 Nancy Ridge Drive
Suite 109
San Diego, CA 92121-3212

POC: Business Development
(800) 437-1518

Solectek Corporation's AIRLAN product line offers wireless network solutions ranging from in-building LANs to building-to-building links of up to 25 miles. In addition to building-to-building communications, AIRLAN offers wireless roaming for mobile computing. The wireless AIRLAN technology is designed to extend existing office networks and can be used for remote network links between buildings that are difficult or expensive to cable.

(Blank)

D

Participating Vendors

Vendors that were surveyed for this report were selected according to their dedication to the wireless technology market and on the availability of their marketing and product information. Survey respondents included company executives and high-ranking marketing personal. Vendor trends and issues discussed in Chapter V represent the views of the following companies:

AIR Communications
274 San Geronimo Way
Sunnyvale, CA 94086
TEL: (800) AIR-DATA

AirLink Communications
4340 Stevens Creek Blvd., Suite 190
San Jose, CA 95429
TEL: (408) 261-6600

American Paging Inc.
1300 Godward Street, NW, Suite 3100
Minneapolis, MN 55413
TEL: (612) 623-3100

Bell Atlantic
1710 H Street, NW
Washington, D.C. 20005
TEL: (202) 392-9900

BellSouth
1800 Century Blvd., NE, Suite 1790
Atlanta, GA 30345
TEL: (404) 728-5900

Clearnet Communications
1305 Pickering Parkway, Suite 300
Pickering, Ontario, Canada L1V 9R2
TEL: (905) 831-6222

Computer Sciences Corp.
3190 Fairview Park Drive
Falls Church, VA 22042
TEL: (703) 876-3500

Dataradio, Inc.
5500 Royal Mount Ave, Suite 200
Town of Mount Royal, Quebec, Canada H4P IH7
TEL: (514) 737-0020

GTSI
4100 Lafayette Center Drive
P.O. Box 10808
Chantilly, VA 22021-0808
TEL: (703) 502-2000

InfraLAN Wireless Communications
380 Massachusetts Ave.
Acton, Massachusetts 01720
TEL: (508) 266-1500

Monicor Electronic Corp.
2964 Northwest 60th Street
Ft. Lauderdale, FL 33309
TEL: (305) 979-1907

Paging Network, Inc.
4965 Preston Park Blvd., Suite 600
Plano, TX 75093
TEL: (214) 985-4100

SkyTel, Inc.
1350 I Street, NW, Suite 1100
Washington, D.C. 20005
TEL: (202) 408-7444/ (800) 759-3228

Wheat International
8229 Boone Blvd., Suite 360
Vienna, VA 22182
TEL: (703) 556-4428

Wireless Connect
2177 Augusta Place
Santa Clara, CA 95051
TEL: (408) 296-1546

(Blank)

E

Glossary of Federal Acronyms

Acronyms and contract terms that appear throughout this document are identified below. These acronyms were encountered during research and interviewing for this report and are important in analysis of the wireless technology market.

BPR	Business Process Reengineering
CAGR	Compound Annual Growth Rate
CAP	Competitive Access Provider
CDPD	Cellular Digital Packet Data
CECOM	Communications Electronics Command of the Army
DISA	Defense Information Systems Agency
DLA	Defense Logistics Agency
DoD	Department of Defense
EDI	Electronic Data Interchange
EPA	Environmental Protection Agency
ESMR	Enhanced Specialized Mobile Radio
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulations
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency

FBI	Federal Bureau of Investigation
FIRMR	Federal Information Resources Management Regulations
FY	Fiscal Year
FTS	Federal Telecommunications System
FTS 2000	Replacement of the Federal Telecommunications System
FWPC	Federal Wireless Policy Committee
FWUF	Federal Wireless Users Forum
GSA	General Services Administration
HPC	High Performance Computing
IR	Infrared Frequency
IRM	Information Resources Management
IRS	Internal Revenue Service
IT	Information Technology
LAN	Local Area Network
LMR	Land Mobile Radio
MAR	INPUT's Market Analysis Program
MHz	Megahertz
NASA	National Aeronautics and Space Administration
NAVSEA	Naval Sea Systems Command
NIST	National Institute of Standards and Technology
NPR	National Performance Review
NSA	National Security Agency
NSF	National Science Foundation

NTIA	National Telecommunications and Information Administration, Department of Commerce
NWN	National Wireless Network
PAR	INPUT's Procurement Analysis Report
PBX	Private Branch Exchange
PCS	Personal Communications Systems
PDA	Personal Digital Assistant
RBOC	Regional Bell Operating Company
RF	Radio Frequency
SMR	Specialized Mobile Radio
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USSS	U.S. Secret Service
VA	Department of Veterans Affairs
VAN	Value-added Network
WLAN	Wireless Local Area Network

(Blank)

F

Questionnaires

Agency Questionnaire

Federal Wireless Technology Market

1. Which of the six major wireless technologies is **your agency currently using** or **planning to use** by the year 2000? (*Please check the appropriate spaces.)*

Product or Service	Present	Next 2 yrs.	Next 5 yrs.
Paging, Faxing and E–mail	____	____	____
Specialized Mobile Radio (SMR)	____	____	____
Two-way Data Only	____	____	____
Cellular	____	____	____
Personal Communication Services (PCS)	____	____	____
Wireless Local Area Network (WLANs)	____	____	____

Can you outline a specific **application in your agency** for any of the wireless technologies listed above?______________________________

____

____

2. How does **your agency obtain** or **plan to obtain** wireless services/products? *(Check all that apply)*

	Present	Future
Directly from vendor	____	____
Competitive procurement	____	____
Existing services contract	____	____
Other (*specify*) ______________________	____	____

3. Do you expect **your agency's spending** on wireless technology over the next 5 years to:

Increase dramatically _____
Increase somewhat _____
Remain the same _____
Decrease somewhat _____
Decrease dramatically _____

What percent of your agency's funding for wireless will be part of:

IT spending _____% **non-IT spending _____%**

4. What **guidelines** does your agency have regarding wireless technology?

5. In your opinion, what are the **three most significant benefits** to using wireless technologies?

1. _____
2. _____
3. _____

6. In your opinion, what are the **three most significant liabilities** to using wireless technologies?

1. _____
2. _____
3. _____

Thank you for your time and consideration.

Vendor Questionnaire

Federal Wireless Technology Market

1. Please indicate the types of wireless services or products **you currently provide** or **plan to provide** by the year 2000. *(Check all that apply.)*

Product or Service	**Current**	**Future**
Paging, Faxing and E–mail	____	____
Specialized Mobile Radio (SMR)	____	____
Two-way Data Only	____	____
Cellular	____	____
Personal Communication Services (PCS)	____	____
Wireless Local Area Network (WLANs)	____	____

2. Please rate on a scale of 1 to 5 (1 being low and 5 being high) **your perspective of the growth potential** in the federal wireless technology market?

1 2 3 4 5

Comment:____

____

3. In your opinion, what are the **top three key factors that will contribute to the growth or non-growth** of the federal wireless technology market?

1. ____
2. ____
3. ____

4. In your opinion, **which agencies provide the most attractive opportunities** for wireless technology services and products? Why?

____________________ ____________________

____________________ ____________________

____________________ ____________________

____________________ ____________________

Comment: ____

____

____

5. In your opinion, what are the **top three advantages of competing** in the federal wireless technology market?

   1. ____________________
   2. ____________________
   3. ____________________

6. Over the next 5 years, **what should vendors do** to make their wireless technology services and products **more valuable** to the federal government?

   ____

   ____

   ____

7. Please rate on a scale of 1 to 5 (1 being low and 5 being high) **your level of success with teaming efforts** in the federal wireless technology market.

   1 2 3 4 5

   Comment:____________________

   ____

8. Please identify **your organization's most frequent/preferred** type of teaming partner. *(Check all that apply.)*

   Hardware and software vendors ____
   Professional services firms ____
   System integrators ____
   Small market niche companies ____
   Local exchange carriers ____
   Local distance carriers ____
   Cellular carriers ____
   Other (*specify*) ____________________ ____

Thank you for your time and consideration.